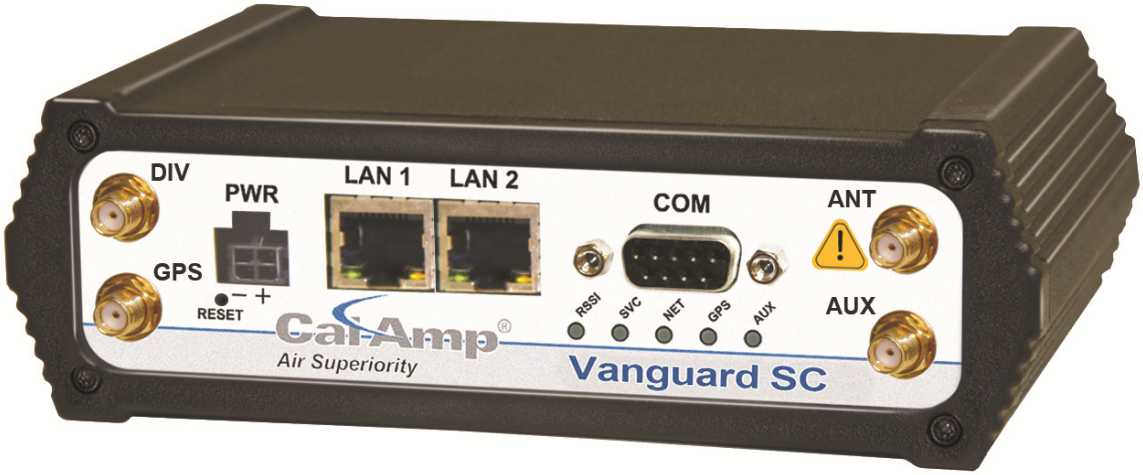


CalAmp

Vanguard SC and Vanguard 3000 Cellular Data Modem & IP Router Series

User Manual
001-7300-100
Revision 0; April 2012

Copyright Notice
©2011 CalAmp. All Rights Reserved.

CalAmp reserves the right to modify the equipment, its specification or this manual without prior notice, in the interest of improving performance, reliability, or servicing. At the time of publication all data is correct for the operation of the equipment at the voltage and/or temperature referred to. Performance data indicates typical values related to the particular product.

No part of this documentation or information supplied may be divulged to any third party without the express written consent of CalAmp. Products offered may contain software which is proprietary to CalAmp. The offer or supply of these products and services does not include or infer any transfer of ownership.

Modem Use
The Vanguard SC and Vanguard 3000 Series modems are designed and intended for use in fixed and mobile applications. "Fixed" assumes the device is physically secured at one location and not easily moved to another location. Please keep the cellular antenna at a safe distance from your head and body while the modem is in use.

Important
Maintain a distance of at least 20 cm (8 inches) between the transmitter's antenna and any person while in use. This modem is designed for use in applications that observe the 20 cm separation distance.

Interference Issues
Avoid possible radio frequency (RF) interference by following these guidelines:

- The use of cellular telephones or devices in aircraft is illegal. Use in aircraft may endanger operation and disrupt the cellular network. Failure to observe this restriction may result in suspension or denial of cellular services to the offender, legal action or both.
- Do not operate in the vicinity of gasoline or diesel-fuel pumps unless use has been approved and authorized.
- Do not operate in locations where medical equipment that the device could interfere with may be in use.
- Do not operate in fuel depots, chemical plants, or blasting areas unless use has been approved and authorized.
- Use care if operating in the vicinity of protected personal medical devices, i.e., hearing aids and pacemakers.
- Operation in the presence of other electronic equipment may cause interference if equipment is incorrectly protected. Follow recommendations for installation from equipment manufacturers.

Mobile Application Safety

- Do not change parameters or perform other maintenance of the Vanguard SC modem and Vanguard 3000 while driving.
- Road safety is crucial. Observe National Regulations for cellular telephones and devices in vehicles.
- Avoid potential interference with vehicle electronics by correctly installing the Vanguard SC modem. CalAmp recommends installation by a professional.

UL Listed models only

When operating at elevated temperature extremes, the surface may exceed +70 Celsius. For user safety, the Vanguard should be installed in a restricted access location.

The SIM/SVC connectors are used for maintenance purposes only. WARNING – EXPLOSION HAZARD, do not connect while circuit is live unless area is known to be non-hazardous.

Revision History

2012 April	Rev 0	Initial Release

Table of Contents

1 Product Overview 8
1.1 Module Identification 9
1.2 Features and Benefits for vanguard sc 9
1.3 Features and Benefits for vanguard 3000 10
1.4 General Specifications 11
1.5 Mechanical Specifications 12
1.6 Order Informaiton 12
1.7 External Connectors 13
1.8 Antenna 15
1.9 power cable pinout 16
1.10 RS-232 Serial Port Integration Parameters 16
1.10.1 ODP (Open Developers Platform) over RS-232 17
2 Getting Started 17
2.1 Package Contents 17
2.2 Device Connections 17
2.3 LAN Configuration 17
2.4 Cellular connections 18
2.4.1 GSM Users 18
2.4.2 CDMA Users 18
3 Vanguard SC and 3000 Web Interface 19
3.1 Unit Status 20
3.1.1 Status 20
3.1.2 Identity 27
3.1.3 Basic Settings 28
3.2 Cell Connection – VANGUARD SC 30
3.2.1 Dial Settings (GSM Models) 30
3.2.2 SIM Settings (GSM MODELS) 31
3.2.3 Dial Settings (CDMA Models) 34
3.2.4 Provisioning Status (CDMA MODELS) 35
3.2.5 Provisioning Profiles (CDMA MODELS) 39
3.3 Cell Connection – VANGUARD 3000 42
3.3.1 Carrier 42
3.3.2 UMTS Settings 43
3.3.3 CDMA Settings 45

3.3.4 System Monitor 48
3.3.5 Dynamic DNS 51
3.4 LAN Settings 52
3.4.1 MAC Filtering 56
3.4.2 IP Filtering 58
3.5 WLAN Settings 61
3.5.1 Main 61
3.5.2 Client 62
3.5.3 Access Point 64
3.5.4 Stats 66
3.5.5 Site Survey 66
3.6 Router 67
3.6.1 Port Forwarding 67
3.6.2 Static Routes 69
3.7 Security 70
3.7.1 Status 70
3.7.2 PPTP 71
3.7.3 IPSec 72
3.7.4 GRE 76
3.8 Serial 77
3.8.1 External Serial 77
3.8.2 Internal Serial 83
3.9 GPS 84
3.9.1 AAVL 84
3.9.2 Settings 87
3.9.3 Status 88
3.10 Diagnostics 89
3.10.1 SNMP 89
3.10.2 Logging 91
3.11 I/O Settings 93
3.11.1 Status 93
3.11.2 Settings 94
3.11.3 Labels 97
3.12 Firmware Update 98

4 IP Addressing 100
4.1 Overview 100
4.2 IP Addressing Tutorial 100
4.3 Private versus Public IP Addresses 101
4.4 Port Forwarding 101
4.5 DMZ 102
4.6 Friendly IP Address 102
5 IPSec and VPN Pass-Through Deployment Guide 102
6 Benefits of IPSec 103
7 Configuration summary 103
7.1 Case#1: Vanguard configured IPSEC Client 104
7.1.1 CISCO Router – VPN Server Configuration Example 104
7.1.2 Vanguard SC – IPSec CLient Configuration Example 106
7.2 Case#2: Vanguard configured VPN Pass-Through 107
7.2.1 Vanguard – VPN Pass-through Configuration example 107
8 User I/O Port 108
8.1 Input Circuit for Analog Inputs 110
8.2 Simplified Circuit for Digital Input/Outputs 110
8.3 Simplified Circuit for Mechanical Relays 110
8.4 Inserting Wires Into User Port Connector 111
9 Service and Support 112
Appendix A – Abbreviations 113
Appendix B – Warranty Statement 114

1 PRODUCT OVERVIEW

The Vanguard SC Series from CalAmp is the ideal solution for a wide range of cellular data network serial and Ethernet connectivity requirements.

CDMA models feature EV-DO Rev A speeds with data rates up to 3.1 Mbps downlink and 1.8 Mbps uplink and are backward compatible to EV-DO Rev 0 and 1xRTT dependant on carrier service availability. This occurs automatically to the level of service available. Dual Band Digital CDMA 800 MHz and CDMA PCS 1900 MHz models supports packet-switched services.

GSM models feature Tri-Band UMTS/HSUPA (850/1900/2100) and Quad-Band GSM/GPRS network support with data rates up to 7.2 Mbps downlink and 2.0 Mbps uplink for HSPA and are backwared compatible to HSUPA, HSDPA, EDGE and GPRS dependent on carrier service availability.

The Vanguard 3000 Series from CalAmp is the ideal solution for a wide range of cellular data network serial and Ethernet connectivity requirements. All Vanguard 3000 models feature both high-speed 3G HSPA and EVDO cellular communications in a single device with full GSM and CDMA backward compatibility. Vanguard 3000 delivers two LAN, one serial and Rx diversity connections.

Mobile models feature an added 16-channel GPS receiver and a WiFi client and access point.

1.1 MODULE IDENTIFICATION

Vanguard SC

The module identification label can be found on the bottom of your Vanguard SC device. This label contains the product part number, the serial number, FCC and IC IDs as well as carrier specific information that will be required when activating your data account.

CDMA module identification labels contain the device ESN numbers. This number is required by your cellular carrier when activating your data contract. The ESN number is provided in both decimal and Hex formats. The format required for activation is carrier dependent.

GSM module identification lables contain an International Mobile Equipment Identity (IMEI) number shown in decimal format. This number is used by the GSM network only to identify and validate the device. It has no permanent or semi-permanent relation to the subscriber.

Figure 1: CDMA Module Idenficiation Label

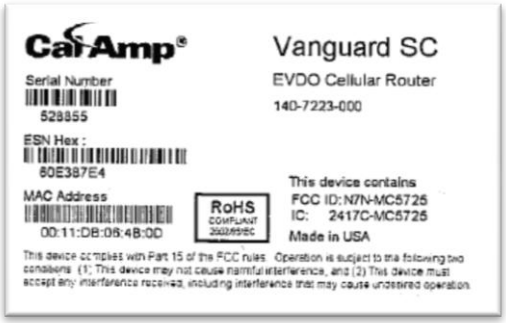
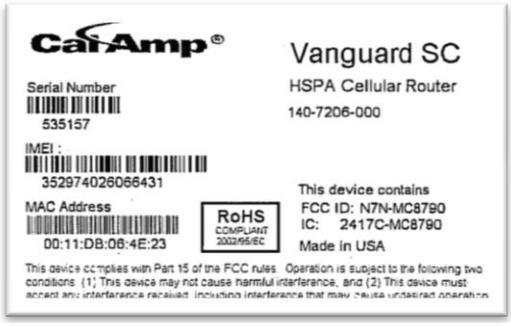


Figure 2: GSM Module Idenficiation Label



1.2 FEATURES AND BENEFITS FOR VANGUARD SC

- Supports Dynamic or Static IP
- Inbound and Outbound Ethernet Routing
- DHCP Server and Inbound port mapping/translation (Port Forwarding)
- Firewall configuration for increased network security
- Diversity antenna port/auxiliary port for increased receive sensitivity
- Local or remote configuration using HTML web server
- TCP/IP Packet assembler and dis-assembler for serial connected devices
- Inbound IP termination with Static IP
- Modem Domain Names with Dynamic DNS
- Embedded Linux on ARM 9 processor
- Internet access and web browsing via Ethernet connector
- VPN support
- On-board 1.8/3V SIM socket (Active only for GSM Models)

Vanguard 3000

- The module identification label can be found on the bottom of your Vanguard 3000 device. This label contains the product part number, the serial number, FCC and IC IDs as well as carrier specific information that will be required when activating your data account.

Figure 3: Fixed Model Idenficiation Label

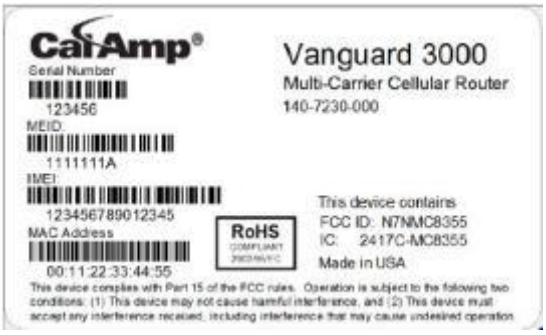
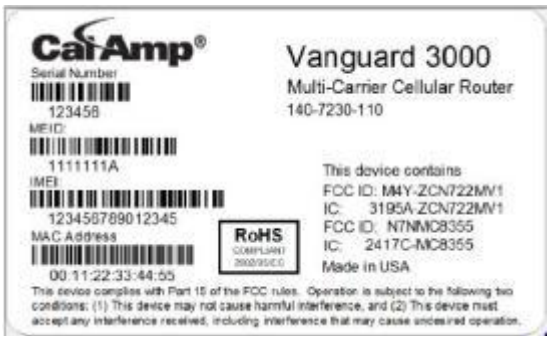


Figure 4: Mobile Model Idenficiation Label



1.3 FEATURES AND BENEFITS FOR VANGUARD 3000

- Multiple carriers in a single device
- Supports Dynamic or Static IP
- Inbound and Outbound Ethernet Routing
- DHCP Server and Inbound port mapping/translation (Port Forwarding)
- Firewall configuration for increased network security
- Diversity antenna port/auxiliary port for increased receive sensitivity
- Local or remote configuration using HTML web server
- TCP/IP Packet assembler and dis-assembler for serial connected devices
- Inbound IP termination with Static IP
- Modem Domain Names with Dynamic DNS
- Embedded Linux on ARM 9 processor
- Internet access and web browsing via Ethernet connector
- VPN support
- On-board 1.8/3V SIM socket (Active only for GSM Models)

1.4 GENERAL SPECIFICATIONS

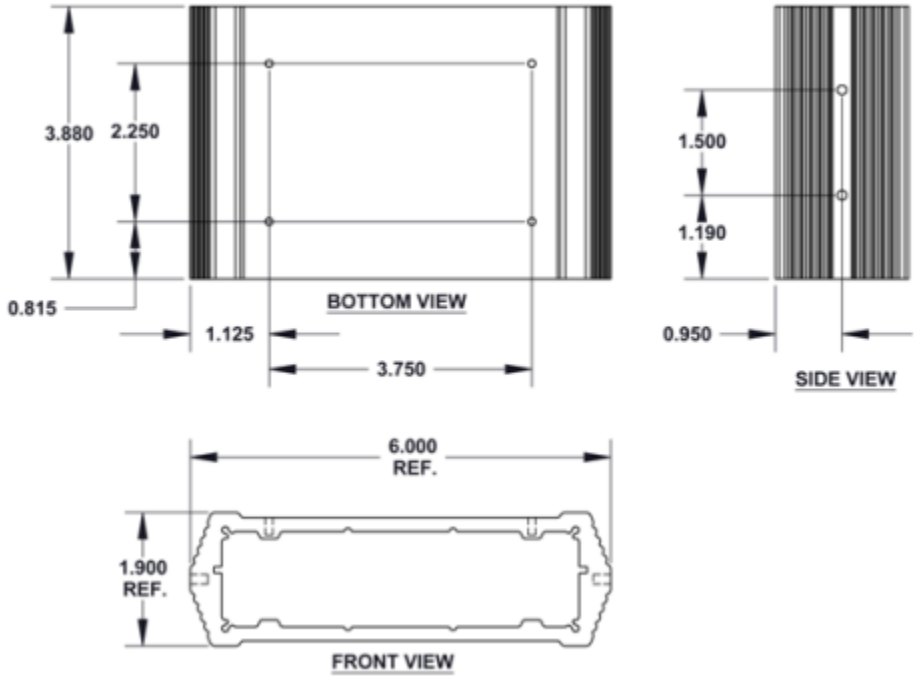
Product specifications are subject to change without notice.

Interface Connectors	RS-232 DE-9S Connector (DCE female) 10/100 Base-T Full Duplex (Dual) 10 Pin I/O Port USB Client port
Power Connector	Molex 43045-4000 MicroFit 3.0, 4 pin header
LED Indicators	RSSI, SVC, NET, GPS, AUX
Antenna Interface	Primary Antenna 50-ohm SMA Female Diversity Antenna 50-ohm SMA Female GPS Antenna 50-ohm, 3.3V SMA Female WiFi Antenna 50-ohm RP-SMA Plug
Size	4.5 (L) x 6.0 (W) x 1.9(H) inches (11.4 x 15.2 x 4.8 cm)
Weight	1.94lb (0.88 kg)
Power Input	9-28 VDC
Maximum TX Power	CDMA 25 dBm GSM/EDGE 33 dBm UMTS 24 dBm
Rx Sensitivity	CDMA >-107 dBm GSM/EDGE >-105 dBm UMTS >-109 dBm
Frequencies	Cellular: TX: 824-849 MHz; Rx: 869-894 MHz PCS: TX: 1850-1910 MHz; Rx: 1930-1990 MHz
Temperature	Operating: -30°C to +70°C 100% duty cycle. *Note: Cellular TX power may be reduced outside this range;* Storage: -40° to +85°C (-40° to +185°F)
Emissions	FCC Part 15b
Transport Protocols	UDP/TCP
Command Protocol	Web Interface

1.5 MECHANICAL SPECIFICATIONS

The following section describes in detail the exterior dimensions of the Vanguard SC modems and how to utilize the mounting flanges to secure the modem to any surface, which can be drilled for such a purpose. The drawings may be used as layout reference, but it is advised that a physical comparison be made to the modem before proceeding with the mounting process.

Figure 5: Vanguard SC Mechanical Drawing



1.6 ORDER INFORMAITON

Table 1 shows the available order options and the part numbers required for ordering Vanguard SC modems.

Table 1 - Vanguard SC Order Information

	Carrier Options	STANDARD MODELS	ADD GPS	ADD GPS + WI-FI
HSPA	GSM CARRIERS	140-7206-000	140-7206-010	140-7206-110

Table 2 - Vanguard 3000 Order Information

	MODELS
FIXED	140-7230-000
MOBILE (GPS + WIFI)	140-7230-110

Table 3 - Vanguard SC and 3000 Accessories

Vanguard SC and 3000 Accessories

	401-7500-001 4” Rubber Duck Antenna
	L2ANT0003 3” Mag Mount Antenna
	150-7001-005 110 VAC Input Power
	401-7100-003 for 3000 only GPS SMA Mag Mount Antenna
	401-7100-004 for 3000 only WiFi Mag Mount Antenna
	150-7001-002 22 FT DC Power Cable (Mobile models) 150-7001-004 6 FT DC 3wire Power Cable (Fixed models)
	L2CAB0002 DB-9 Serial Cable
	L2CAB0006 7’ Ethernet cable

1.7 EXTERNAL CONNECTORS

This section describes the external connectors for the Vanguard SC modem.

- Figure 6 shows the front panel connections for Standard (Fixed) models.
- Figure 7 shows the front panel connections for Mobile models with GPS and WiFi.
- Figure 8 shows the rear panel for all models.

Table 4 describes these connections.

Figure 6: Front Panel Standard Models

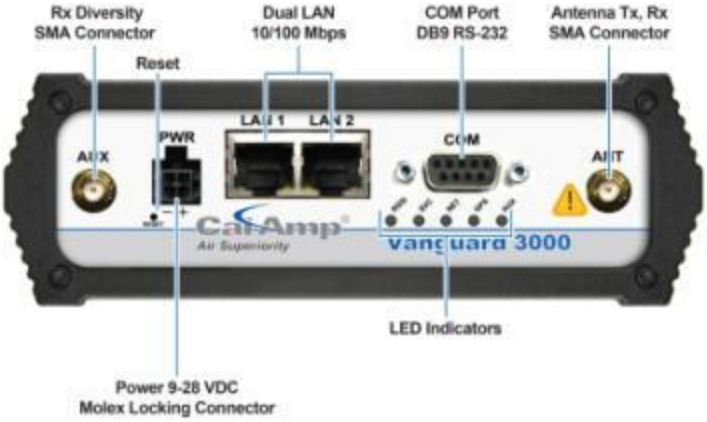


Figure 7: Front Panel Mobile Models with GPS and WiFi

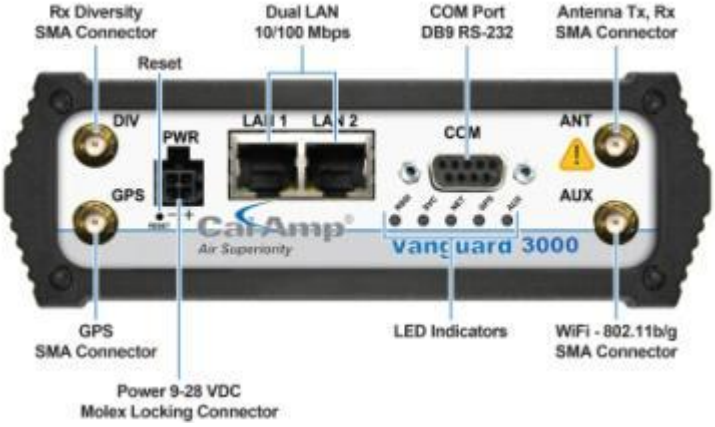


Figure 8: Rear Panel Connections

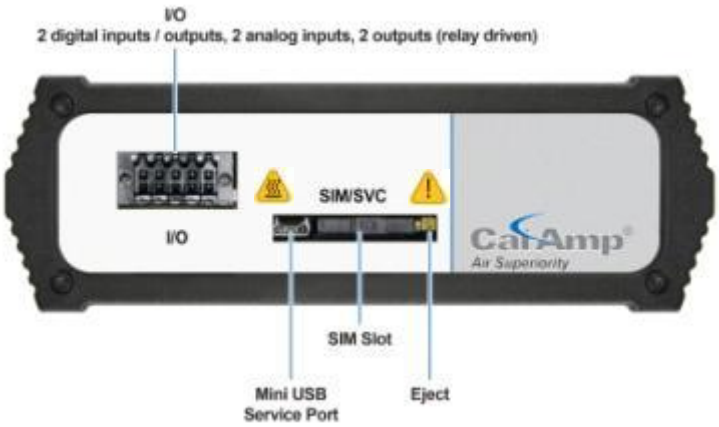


Table 4 - External Connectors

Panel Indicator	Connection	Description
COM	RS-232	Serial to IP conversion use
ANT	SMA	Primary RF Antenna
AUX (Figure 4)	SMA	Cellular Diversity or Cellular/GPS combination antenna
AUX (Figure 5)	RP-SMA	Wi-Fi antenna
GPS	SMA	GPS Antenna
DIV	SMA	Cellular Diversity Antenna
LAN 1, LAN 2	RJ-45	Interface for Ethernet connection to devices
SIM/SVC	USB Mini	Available for CalAmp Support Use Only
RESET		Hold for one second to reset unit. If held for at least 4 sec, unit will reconfigure to factory default settings.
PWR Jack	Molex 43025-0400; Power – bottom pins; I/O – top pins	Interface for power plug (9-28VDC) Interface for Input and Output control lines; ODP use only.
SIM/SVC	SIM Card socket	Interface for SIM card. Your wireless service provider will supply the SIM card with your wireless service contract.

Table 5 - Status LEDs

Function	Off	Green	Flash Green	Red	Flash Red	Amber	Flash Amber
RSSI		Strong		Weak/None		Medium	
SVC		3G	3G/NC		NC	2G	2G/NC
NET	No Connectivity		RX Data		TX Data		RX/TX
GPS	Disabled	Fix	Search	No Fix			
Aux	Disabled	Good		Failed			

- If SVC is solid, then modem is connected to internet. If flashing, the modem is trying to connect to the network.
- Net indicates direction of data.
- Aux refers to WiFi in mobile models.

The LEDs act different than the table at boot. The boot sequence is: All Red, All Amber, All Green, All Flash Green 3 times. Boot sequence is complete.

1.8 ANTENNA

Primary antenna connections are SMA female connectors and must be used with antenna with SMA male connectors. When using a direct mount or rubber duck antenna, choose the antenna specific to your band requirements. Mounting options and cable lengths are user's choice and application specific.

The AUX antenna connector is installed on all standard models and can be used for Diversity or True GPS. The diversity port supports three bands, Cellular (850 MHZ), PCS(1900 MHZ), and GPS(1575 MHZ). Connect a dual band cellular antenna to this port to implement RX diversity on the unit and increase receive sensitivity on the cellular network. Connect a GPS

antenna, with an average gain >-5dBi, if using the GPS functionality. If both RX diversity and GPS are required, install a Cellular/GPS combo antenna.

This device is configured with default settings and is ready to be configured via HTML. Some configurations may be set using AT commands.

1.9 POWER CABLE PINOUT

Depending on the version of Vanguard ordered there are two possible power cables. The mobile version ships with a 22FT power cable that requires a fuse (included). The fixed version ships with a 6 ft cable that does not require a fuse. Regardless of the cable length, the pinout is the same though the wire colors differ slightly.

Pin	Signal	Color Mobile	Color Fixed
1	VIN/VBatt	Red	Red
2	Ground	Blue	Black
3	Ignition Sense	White	White
4	No Connect	NA	NA

When installed for a fixed application or if the Ignition sense line is not required in a mobile application, the ignition sense line should be shorted to Vin/Vbattery.

1.10 RS-232 SERIAL PORT INTEGRATION PARAMETERS

Table 6 provides the serial cable design information to integrate the Vanguard SC modem into your system. Table 7 gives the default RS-232 communication parameters.

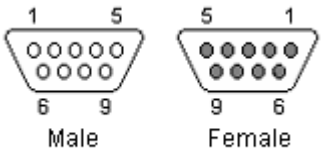
Table 6 - Standard RS-232 DE-9 Pin out

Pin	Name	Direction	Description
1	CD	←	Carrier Detect
2	RX	←	Receive Daa
3	TX	→	Transmit Data
4	DTR	→	Data Terminal Ready
5	GND		System Ground
6	DSR	←	Data Set Ready
7	RTS	→	Request to Send
8	CTS	←	Clear to Send
9	RI	←	Ring Indicator
Note: Direction is DTE relative DCE			

Table 7 - Default RS-232 Communication Parameters

Bits Per Second	115,200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Figure 9: DE-9 Connectors



1.10.1 ODP (OPEN DEVELOPERS PLATFORM) OVER RS-232

This device includes the Open Developers Platform (ODP), which permits customers to develop their own Linux based applications which run on the modem's ARM9 (AT91RM9200) processor. The customer's application can utilize the external RS-232 port, and or an internal 3 pin (GND, RXD, TXD) RS-232 port and is able to transfer data over the cellular WAN using the linux socket libraries. The Vanguard SC firmware also supports an API that allows the customer's application to access diagnostic data from the cell module such as connection status and RSSI. More information and support is provided by CalAmp's Applications Engineering organization.

2 GETTING STARTED

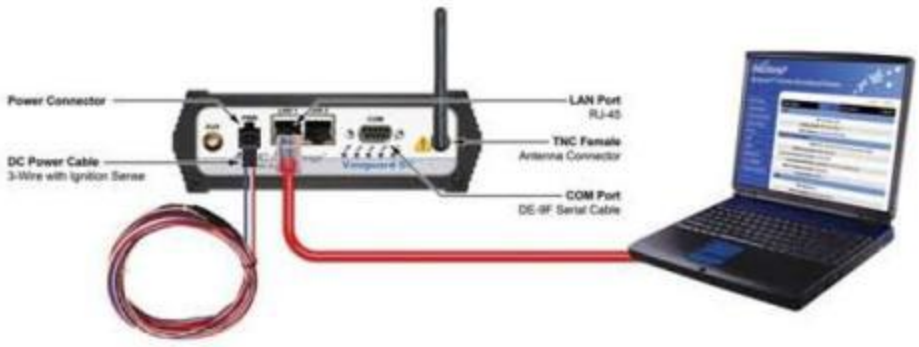
2.1 PACKAGE CONTENTS

- Vanguard SC or 3000 Modem
- Power Cable
- Information Card

2.2 DEVICE CONNECTIONS

1. (GSM Users) Insert the SIM card into the SIM/SVC slot as shown.

2. Connect an antenna to the ANT connector on the front panel of the Vanguard SC modem.
3. Connect an Ethernet cable into the LAN 1 port and plug the other end into the network port of your PC.
4. Connect the Power Adapter to the modem PWR port and plug into a proper AC power socket.

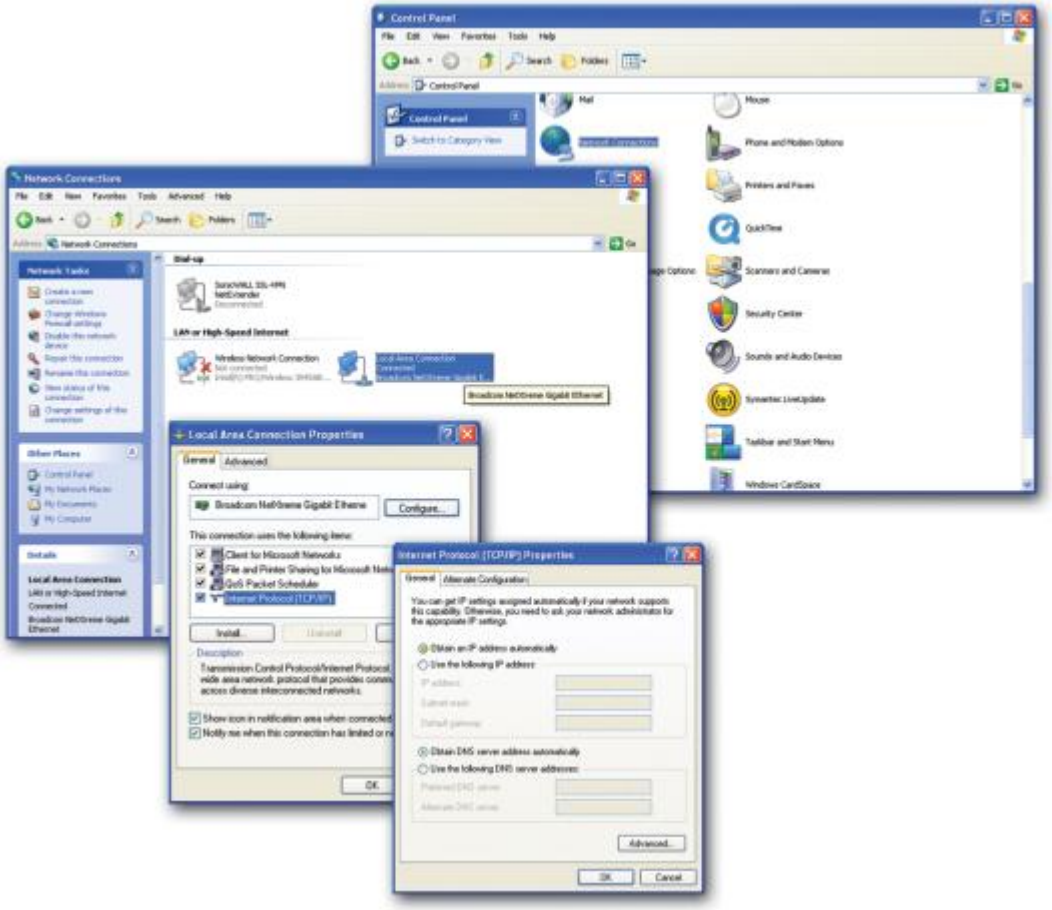


2.3 LAN CONFIGURATION

This device is configured via the Internet which automatically allows your computer to obtain the proper IP address. For Windows XP users, select **Start** » **Control Panel** » **Network Connections**. Right click **Local Area Connection** and select

Properties to open the configuration dialog box for Local Area Connection. Select **Internet Protocol (TCP/IP)** and click **Properties** to open the TCP/IP configuration window. On the General tab, select **Obtain an IP address automatically** and **Obtain DNS server address automatically**. Click **OK** to complete TCP/IP configuration.

Figure 10: LAN Configuration Screens



2.4 CELLULAR CONNECTIONS

Before you begin, you will need an active Cellular account with the carrier of your choice.

2.4.1 GSM USERS

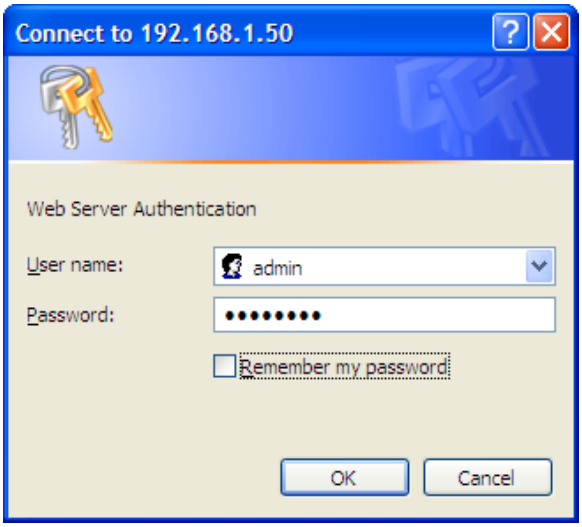
Insert the SIM card with the gold side up into the SIM/SVC slot in the rear of the device. Push the card completely into the slot until it clicks in place. If you have already powered your device, you will need to cycle power to register the SIM for proper operation.

2.4.2 CDMA USERS

Refer to Section 3.2.3 to provision your modem for proper operation.

3 VANGUARD SC AND 3000 WEB INTERFACE

Start your web browser and enter 192.168.1.50 in the address bar. A login screen should appear.



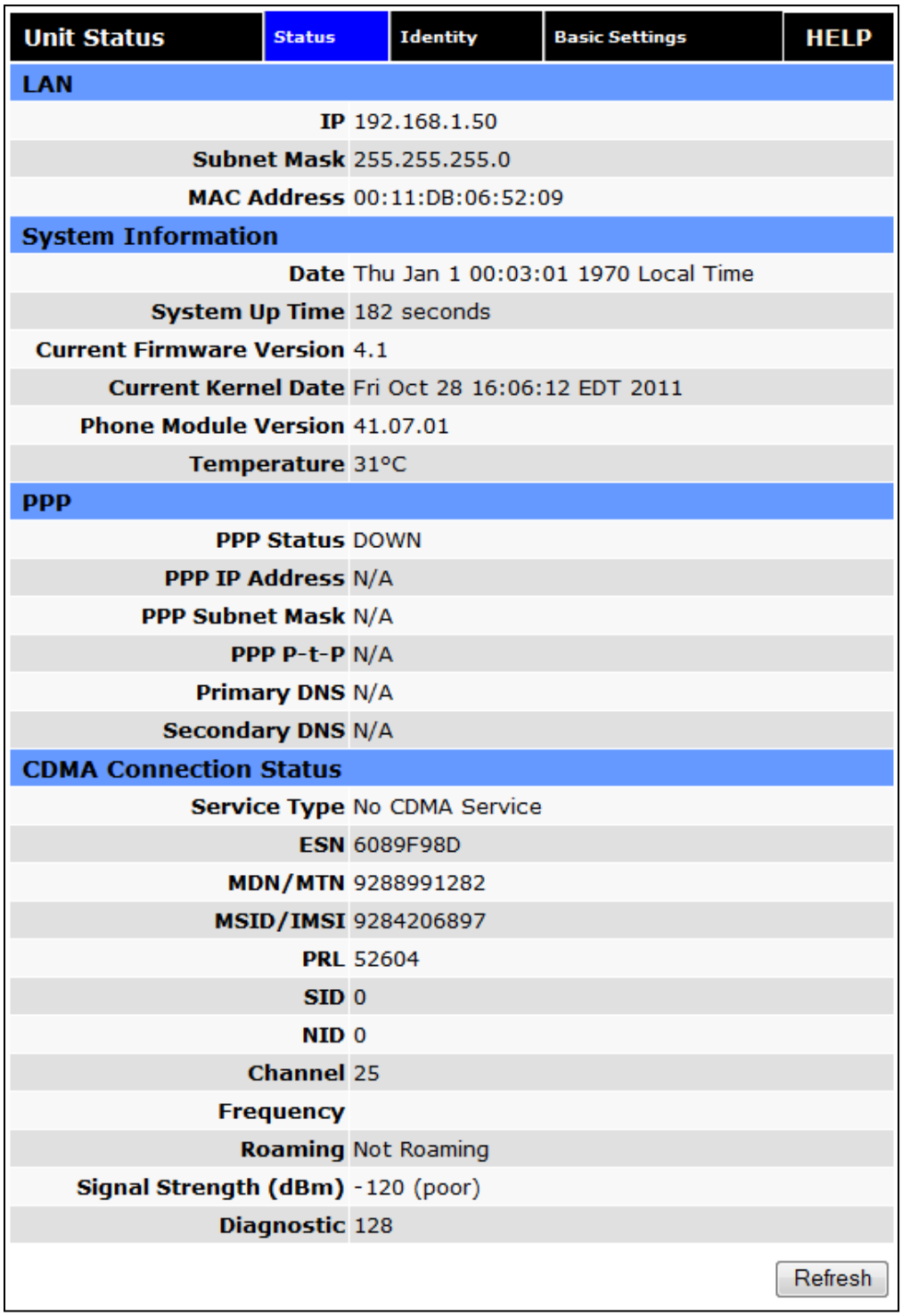
Enter the User Name: admin and the Password: password and click OK to log into the modem's Home Page. Vanguard SC Web interface is divided into two sections. On the left is the main navigation panel (shown in Figure 9). On the right is the content area for the desired page (shown in Figures 10-11).

Figure 11: Main Navigation Panel

3.1 UNIT STATUS

3.1.1 STATUS

Figure 12: Vanguard SC CDMA Unit Status Window



Unit Status	Status	Identity	Basic Settings	HELP
LAN				
IP	192.168.1.50			
Subnet Mask	255.255.255.0			
MAC Address	00:11:DB:06:52:09			
System Information				
Date	Thu Jan 1 00:03:01 1970 Local Time			
System Up Time	182 seconds			
Current Firmware Version	4.1			
Current Kernel Date	Fri Oct 28 16:06:12 EDT 2011			
Phone Module Version	41.07.01			
Temperature	31°C			
PPP				
PPP Status	DOWN			
PPP IP Address	N/A			
PPP Subnet Mask	N/A			
PPP P-t-P	N/A			
Primary DNS	N/A			
Secondary DNS	N/A			
CDMA Connection Status				
Service Type	No CDMA Service			
ESN	6089F98D			
MDN/MTN	9288991282			
MSID/IMSI	9284206897			
PRL	52604			
SID	0			
NID	0			
Channel	25			
Frequency				
Roaming	Not Roaming			
Signal Strength (dBm)	-120 (poor)			
Diagnostic	128			

Refresh

Figure 13: Vanguard 3000 Unit Status (GSM) Window

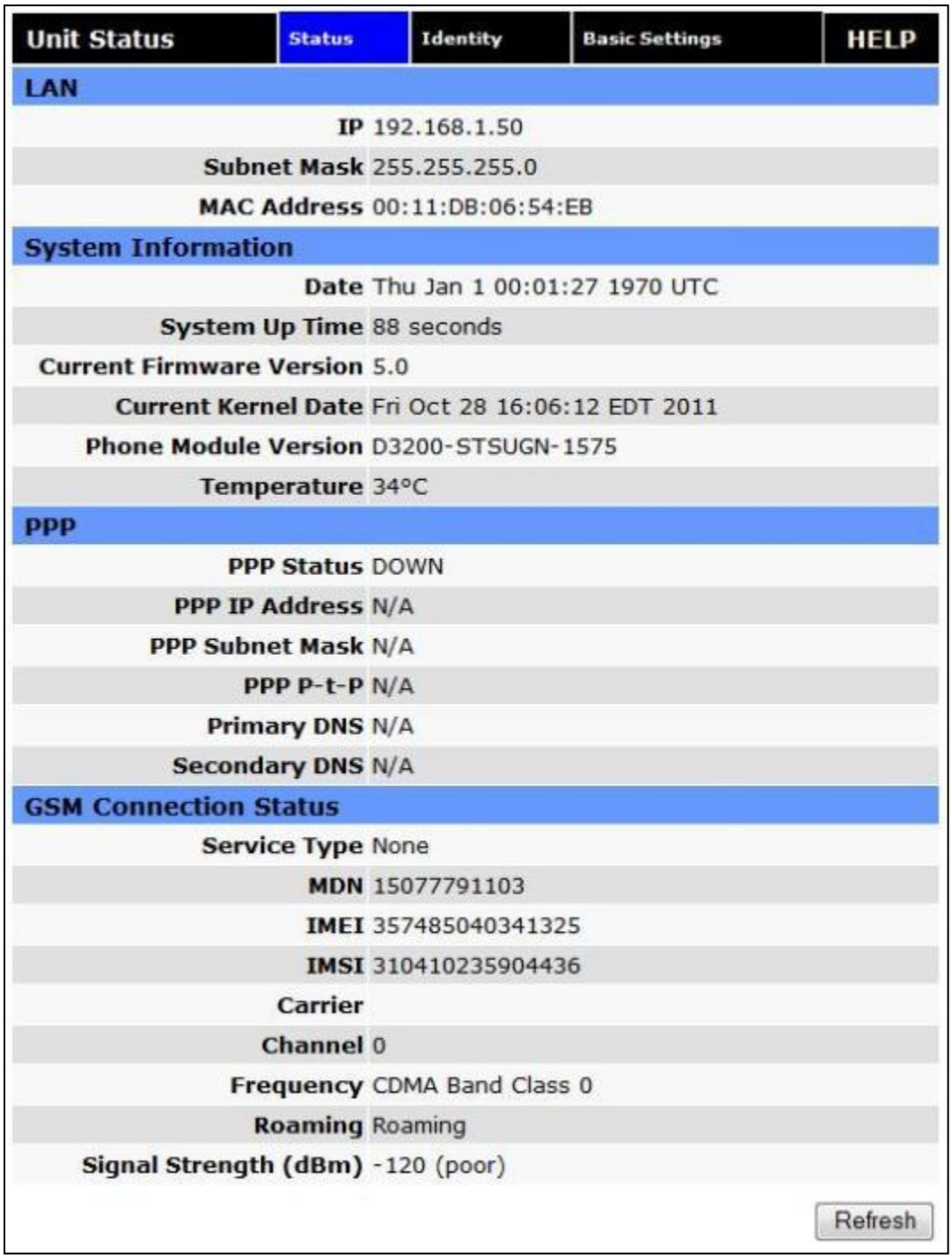
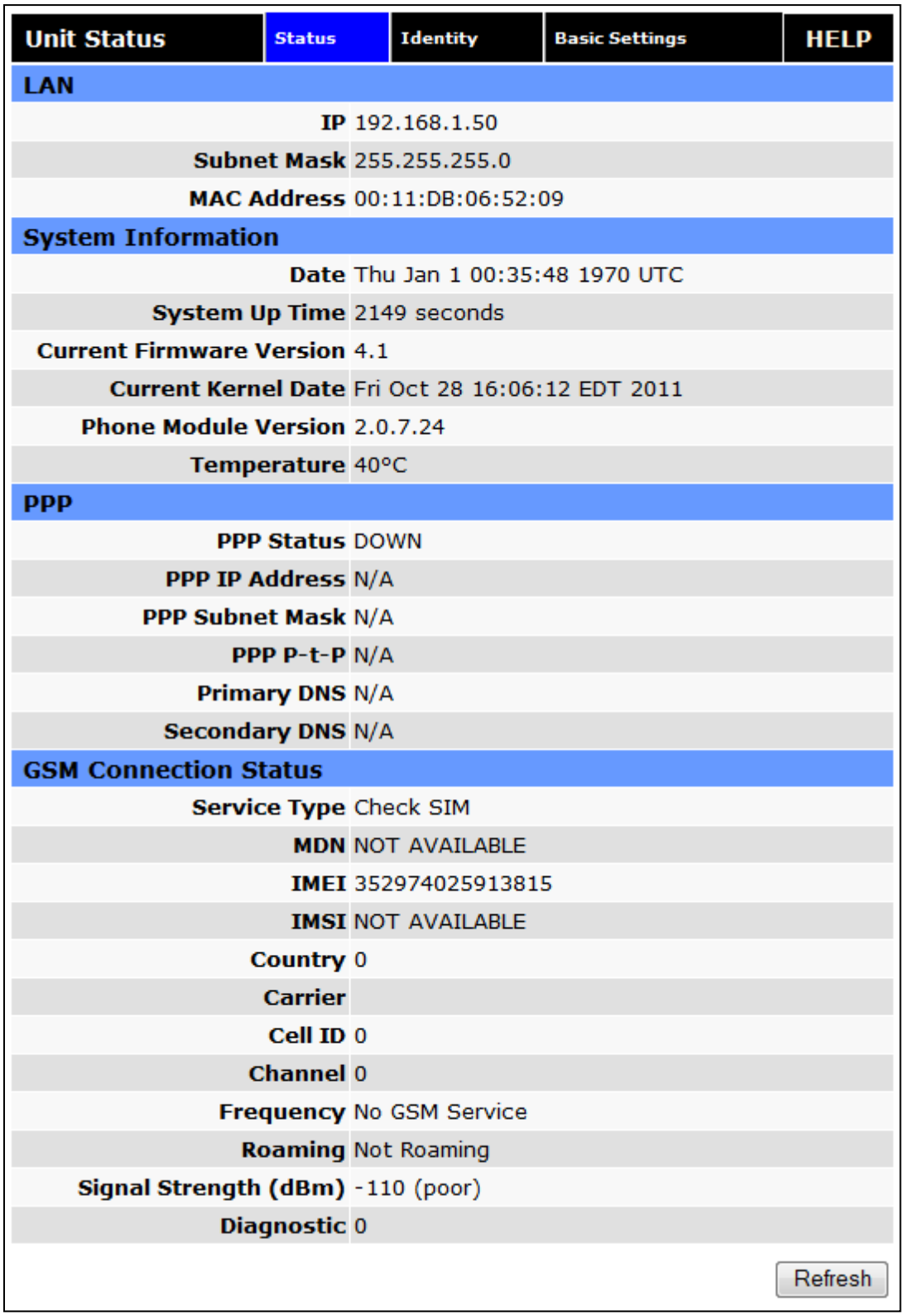


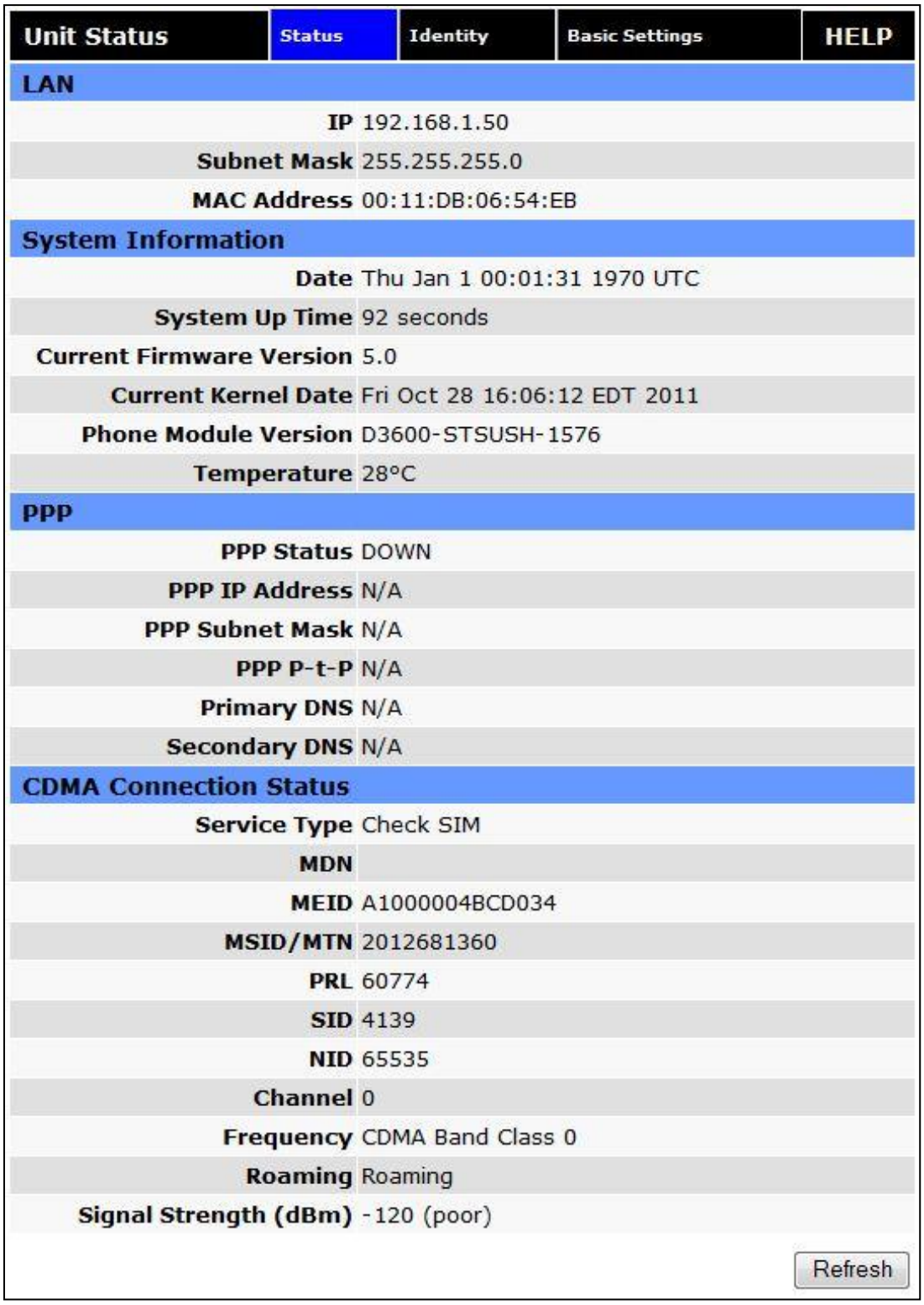
Figure 14: Vanguard SC GSM Unit Status



Unit Status	Status	Identity	Basic Settings	HELP
LAN				
IP	192.168.1.50			
Subnet Mask	255.255.255.0			
MAC Address	00:11:DB:06:52:09			
System Information				
Date	Thu Jan 1 00:35:48 1970 UTC			
System Up Time	2149 seconds			
Current Firmware Version	4.1			
Current Kernel Date	Fri Oct 28 16:06:12 EDT 2011			
Phone Module Version	2.0.7.24			
Temperature	40°C			
PPP				
PPP Status	DOWN			
PPP IP Address	N/A			
PPP Subnet Mask	N/A			
PPP P-t-P	N/A			
Primary DNS	N/A			
Secondary DNS	N/A			
GSM Connection Status				
Service Type	Check SIM			
MDN	NOT AVAILABLE			
IMEI	352974025913815			
IMSI	NOT AVAILABLE			
Country	0			
Carrier				
Cell ID	0			
Channel	0			
Frequency	No GSM Service			
Roaming	Not Roaming			
Signal Strength (dBm)	-110 (poor)			
Diagnostic	0			

Refresh

Figure 15: Vanguard 3000 Unit Status (CDMA) Window



LAN

- **IP**
  Displays LAN side static IP information for this device (the modem). Note: Once this IP address has been changed and saved, the browser connection to the device will be lost. To continue configuration, please connect to the (new) IP address / the address that has been entered and saved.

- **Subnet Mask**
  Displays the LAN side subnet mask for the modem

- **MAC Address**
  Media Access Control Address. Every Ethernet device (i.e. LAN cards) has a unique hardware serial number or MAC address to identify each Network Device from all others.

System Information

- **Date**
  Displays the current date and time (UTC) as received from the cellular carrier. The date and time information is updated at the start of each PPP connection, and then maintained internally until the modem is rebooted. If no PPP connection has been made this boot cycle, the time display will not be accurate. This is not a user settable function – it is controlled only by the carrier supplied date and time. Not all carriers support this function.

- **System Up time**
  Displays the system uptime in seconds:
  - 1 minute = 60 seconds
  - 1 hour = 3600 seconds
  - 1 day = 86400 seconds
  - 1 year = 31,536,000 seconds

- **Current Firmware Version**
  Displays the current modem firmware version loaded. Please visit www.calamp.com for the latest updates.

- **Kernel Date**
  Displays the date of the operating system kernel the unit is running

- **Phone Module Version**
  This will vary depending on the vendor of the radio module inside the modem.

- **Temperature**
  Displays the current internal temperature of the modem, as measured by the cellular radio module.

PPP

- **PPP Status**
  Indicates the status of the cellular connection, usually UP when connected properly.

- **PPP IP Address**
  The current IP address of the Vanguard on the cellular network.

- **PPP Subnet Mask**
  The current Subnet Mask of the Vanguard on the cellular network.

- **PPP P-t-P**
  The "point-to-point" address of the gateway on the cellular network, It may be possible to ping this address to determine if a PPP IP Address assigned is routable from the Internet.

- **Primary DNS**
  The Primary DNS server, as assigned by the cellular carrier, when PPP is UP.

- **Secondary DNS**
  The Secondary DNS server, as assigned by the cellular carrier, when PPP is UP.

CDMA Connection Status

- **Service Type**
  Determines the type of network your device has connected to; GPRS, EDGE, UMTS, HSDPA, CDMA 1xRTT, EVDO Rev0 or RevA.

- **ESN**
  The Electronic Serial Number is only applicable for the CDMA product line, carrier specific (Alltel, Verizon, Sprint, etc).

- **MDN/MTN**
  The actual phone number of the device as supplied by the carrier. When the unit is successfully provisioned, the phone number for the user account will be displayed.

- **MIN/IMSI**
  This number is used by the Mobile Telephone Network and will be different if ported from another carrier (not used by end user of device).

- **PRL**
  Preferred Roaming List, only applicable for the CDMA product line, carrier specific (AllTel, Verizon, Sprint, etc).

- **SID**
  System ID (Identity), provided by the Carrier.

- **NID**
  Network Identifier, this is supplied automatically from the network.

- **Channel**
  Cell Site channel number at which the modem is connected and is useful for the carrier in the event of troubleshooting.

- **Frequency**
  Cellular frequency band the modem is using, 800MHz and 1900MHz are mainly in the US and outlying areas. In some cases 900 and 1800 will be seen for European or Foreign carriers.

- **Roaming**
  Options are either Roaming or Not Roaming and may defer from the PRL in the case of CDMA.

- **Signal Strength (dBm)**
  Measured in dBm, this is the Received Signal Strength Indicator (RSSI).

- **Diagnostic**
  If less than 128, this is the number of successful PPP connections since the modem was rebooted. If 128 or greater, the formula Diagnostic value – 128 = the number of times the cellular module has been reset since the modem was rebooted.

GSM Connection Status

- **Service Type:**
  Determines the type of network your device has connected to; GPRS, EDGE, HSDPA, HSUPA, or HSPA. "Check SIM" will be displayed if the SIM is invalid, missing, or if the PIN needs to be entered.

- **MDN:**
  The Mobile Directory Number is the phone number assigned to the SIM card supplied by the carrier. The MDN may display “NOT AVAILABLE” if the PIN status is disabled or the MDN is unknown.

- **IMEI:**
  The International Mobile Equipment Identity is a unique 15-digit number that serves as the serial number of the GSM module in the modem.

- **IMSI:**
  The International Mobile Subscriber Identity is a unique number which designates the subscriber. This number is used for provisioning in network elements. The IMSI may display “NOT AVAILABLE” if a SIM card is not detected.

- **Country:**
  Country name or code associated with the GSM network.

- **Carrier:**
  Cellular provider name or code.

- **Cell ID:**
  Network Identifier, this is supplied automatically from the network.

- **Channel:**
  Cell Site channel number at which the modem is connected and is useful for the carrier in the event of troubleshooting.

- **Frequency:**
  Cellular frequency band the modem is using, 800MHz and 1900MHz are mainly in the US and outlying areas. In some cases 900 and 1800 will be seen for European or Foreign carriers.

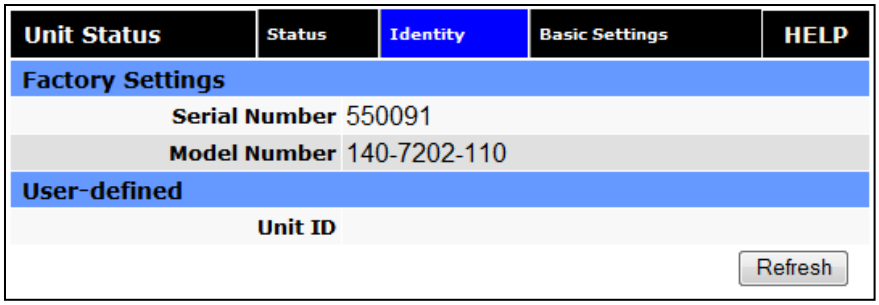
- **Roaming:**
  Options are either Roaming or Not Roaming.

- **Signal Strength (dBm):**
  Measured in dBm, this is the Received Signal Strength Indicator (RSSI).

- **Diagnostic:**
  If this number is less than 128, it is the number of PPP connections made since the last reboot of the modem. If this number is 128 or more, the formula 128-Diagnostic value equals the number of times the cellular radio module has been reset.

3.1.2 IDENTITY

Figure 16: Unit Status – Identity



Factory Settings

- **Serial Number:**
  Unique serial number for this unit.

- **Model Number**
  Unit model number defining its capacity and features.

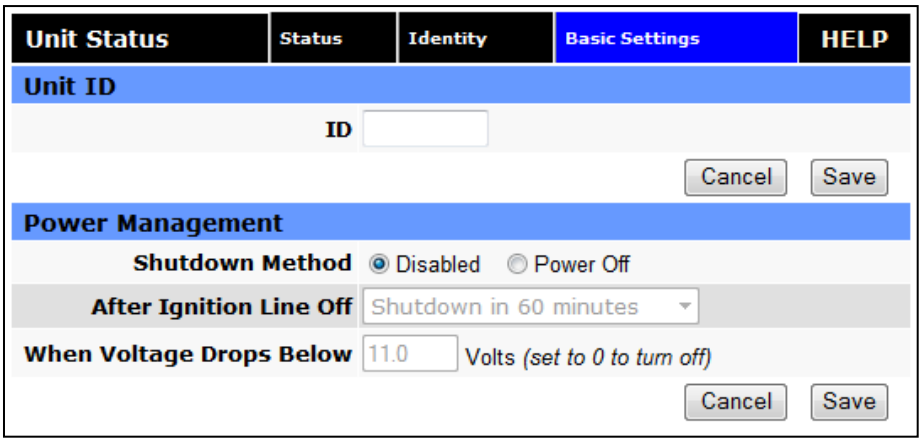
User-defined

- **Unit ID**
  User-defined for ease of reference, used by various services.

3.1.3 BASIC SETTINGS

Figure 17: Unit Status – Basic Settings

Vanguard SC



Vanguard 3000

Unit ID

- **ID**
  This identification number serves to distinguish this unit from other units in the network. It is at the same time the TAIP identification for GPS reporting and serves as the 'syslocation' for the SNMP facility.

Power Management

- **ID**
  This identification number serves to distinguish this unit from other units in the network. It is at the same time the TAIP identification for GPS reporting and serves as the 'syslocation' for the SNMP facility.

Power Management

The Vanguard 3000 unit is designed to stay ON even if the ignition is turned off. The unit can be configured to automatically shut down 1, 5, 30, 60 or 240 minutes after ignition has been turned off or when the supply voltage drops to a certain level.

- **Shutdown Method**
  Disabled by default. Select "Power off" to enable power management.

- **After Ignition Line Off**
  Select between the following time intervals: 1, 5, 30, 60 or 240 minutes.

- **When Voltage Drops Below**
  Enter desired voltage. Enter "0" to disable (and give precedence to time delay configured under "After ignition time off").

Network Time

The Vanguard 3000 is capable of maintaining the current time (UTC) by synchronizing itself with a Network Time Protocol (NTP) Server. The user may specify a server URL and how frequently the router should synchronize with the server. The router must have an internet connection to synchronize with the server. The router does not save/track time while powered off, so time will be inaccurate until the router can connect with the server.

- **NTP Client**
  Disabled by default. Select Enabled to activate the router's NTP client to synchronize with the specified server.

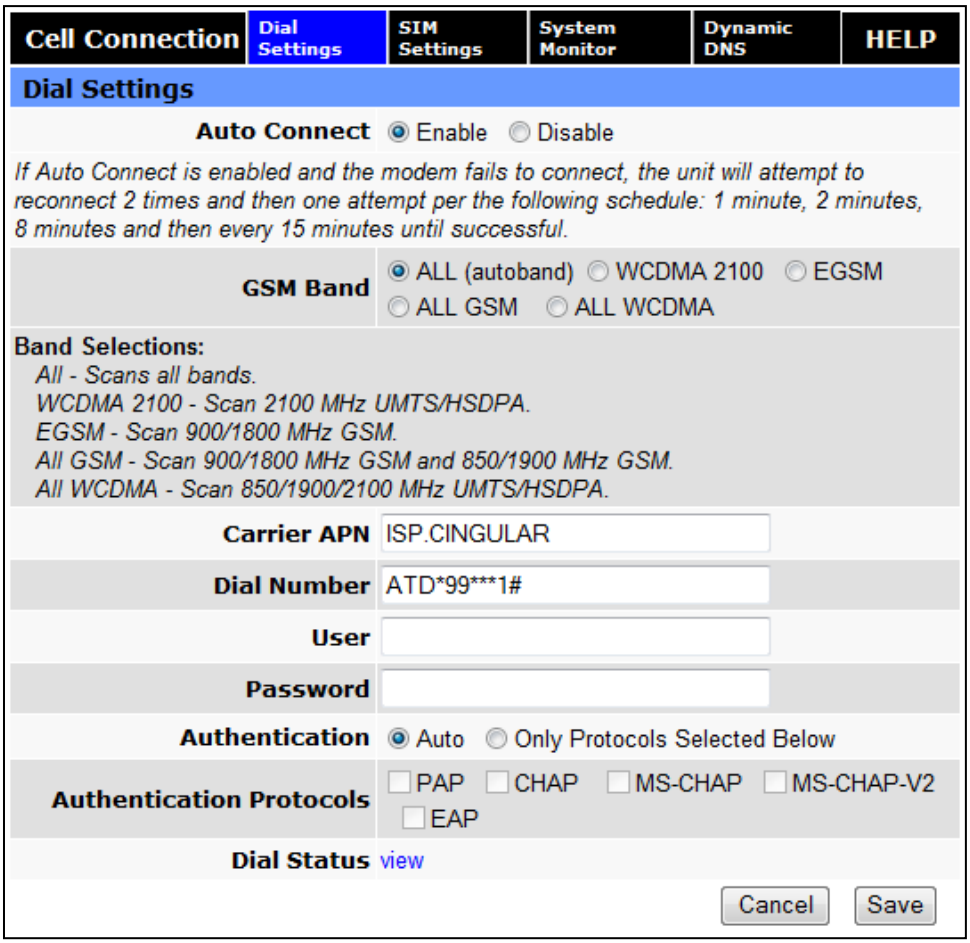
- **NTP Server**
  Enter the URL of the desired NTP Server. Most NTP Servers have a posted usage policy. A review usage policies and the choice of an appropriate server is recommended.

- **Update Frequency**
  Set to 24 hours by default. Specify the frequency to synchronize the router time with the specified NTP Server.

3.2 CELL CONNECTION – VANGUARD SC

3.2.1 DIAL SETTINGS (GSM MODELS)

Figure 18: Cell Connection – GSM Dial Settings



Dial Settings

- **Auto Connect:**
  When set to Enable, will allow the modem to automatically dial the connection when the modem is powered. When set to Disable, the modem will not automatically dial the connection to the cellular provider and will not attempt to automatically re-connect when the connection has dropped.

- **GSM Band:**
  This selection is used to configure the modem to operate on a set of frequency bands.
  - ALL – All available bands will be accessible, commonly called autoband. (Default)
  - WCDMA 2100 – Uses the 2100MHz frequency band in UMTS/HSDPA networks.
  - EGSM – Uses the 900/1800 MHz European GSM frequency band.
  - ALL GSM – Can use any available GSM frequency band, Europe 900/1800 MHz or USA 850/1900 MHz.
  - ALL WCDMA – Can use any available WCDMA frequency band, 850/900/2100 MHz in UMTS/HSDPA networks.

- **Carrier APN:**
  The Access Point Name provided by the cellular provider required to access the network.

- **Dial Number:**
  The phone number used to initiate a data connection to the cellular provider via PPP.

- **User:**
  Sets the username required by the cellular provider. Leave blank if not required.Warning: If used in combination with this modem's VPN Server, this username and password will also be valid on this modem's VPN Server.

- **Password:**
  Sets the password required by the cellular provider. Leave blank if not required.Warning: If used in combination with this modem's VPN Server, this username and password will also be valid on this modem's VPN Server.

- **Authentication:**
  Selects the authentication protocol used. If Auto is selected, the Vanguard will automatically select a protocol. If Only Protocols Selected Below is chosen, then the router will only accept requests for the specified protocols.

- **Authentication Protocols:**
  If Only Protocols Selected Below is chosen, then these fields are used to specify each Authentication protocol that router will accept. At least 1 must be selected. If Auto is selected, these choices will be disabled (greyed out).

- **Dial Status:**
  Click "view" to see a log from the last connection attempt.

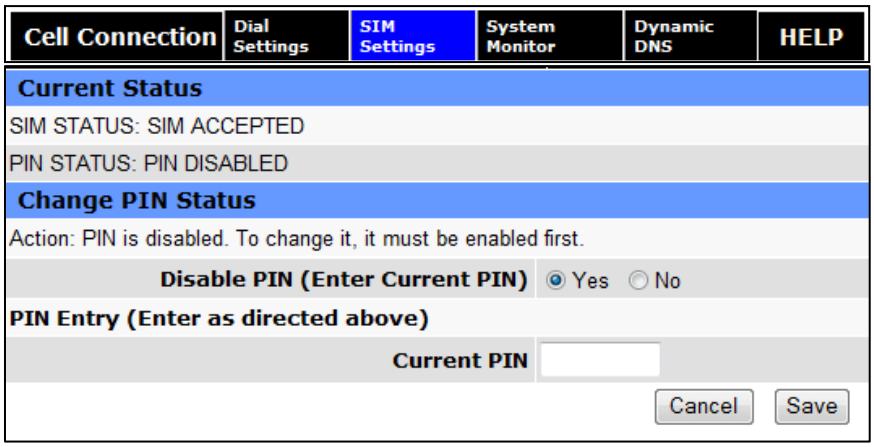
3.2.2 SIM SETTINGS (GSM MODELS)

One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information. This allows the user to retain his or her information after switching handsets. The SIM has a security feature which, when enabled, will require the user to enter a valid PIN before the modem will connect to the cellular network.

From the Home page, select SIM Settings from the left navigation panel to confirm the modem recognized the SIM card.

SIM STATUS should read ACCEPTED. PIN STATUS may show the PIN to be DISABLED or ACCEPTED.

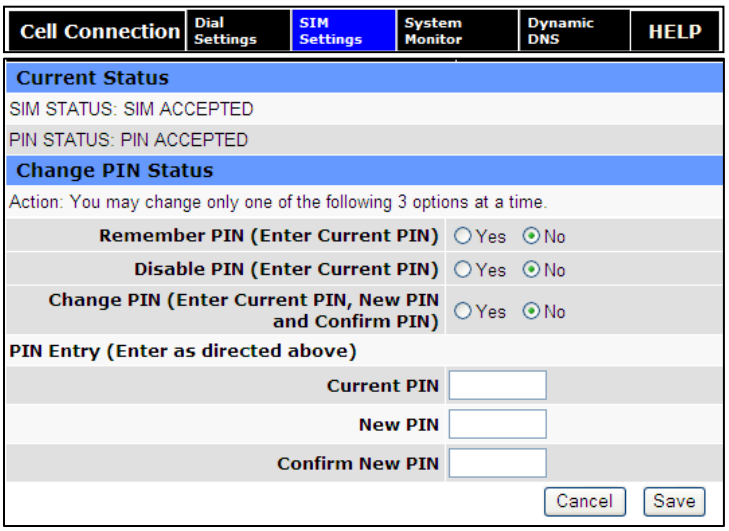
Figure 19: Cell Conection – SIM Settings



3.2.2.1 ENABLING PIN SECURITY

As shown in the previous section, the default setting for PIN Security is disabled. Before enabling the PIN Security feature, make sure you have the PIN number provided by your wireless carrier. Change the Disable PIN setting from Yes (shown in Figure 19) to NO. Enter your carrier provided PIN into the Current PIN field. Click SAVE to access the PIN Security Settings (shown in Figure 20).

Figure 20: PIN ACCEPTED Security Enabled



The PIN security feature is now enabled. PIN STATUS shows that the PIN has been ACCEPTED. Each time modem power is cycled, the proper PIN will need to be entered in order for the modem to dial out. Upon restart, the PIN is entered from the SIM Settings page (shown in Figure 21). The PIN STATUS displays PIN REQUIRED, Enter PIN 3 attempts left.

3.2.2.2 PIN SECURITY OPTIONS

After PIN security has been enabled, the SIM page will display three options for changing the PIN functionality, **Remember PIN**, **Disable PIN**, or **Change PIN**. Only one of these options can be changed and saved at a time.

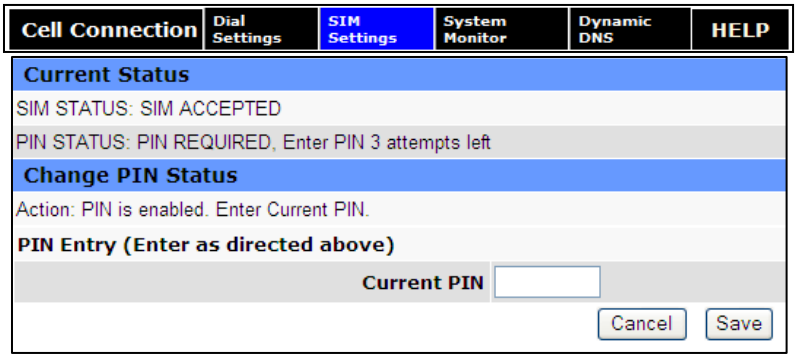
- **Remember PIN:**
  Selecting YES will allow the modem to remember the security PIN making it unnecessary to enter the PIN each time the modem tries to connect to the network. Selecting NO will set the modem to not remember the current PIN, requiring the user to enter the PIN when requested. Since only the modem remembers the PIN, using the SIM card in a different modem will require PIN authorization to dial out.

- **Disable PIN:**
  Selecting YES will disable the PIN security feature; the current PIN will need to be entered to allow disabling. A selection of NO indicates that PIN security is enabled.

- **Change PIN:**
  Selecting YES will allow the user to change the current PIN to a new one. Selecting NO will not require the user to change the PIN in the New PIN and Confirm PIN fields. When changing PINs, the user is required to input the current PIN, the new PIN, and the new PIN again in the fields provided.

After one of the options is changed, click the **SAVE** button to refresh the page showing the changes.

Figure 21: SIM Settings for PIN Required



At this point the user has 3 attempts to enter the correct PIN. If the correct PIN is not entered after 3 attempts, an unlock code or PIN Unblocking Key (PUK) from the service provider will be required before the SIM card is usable again. Figure 22 shows the SIM settings after an incorrect PIN has been entered.

Figure 22: SIM PIN Rejected

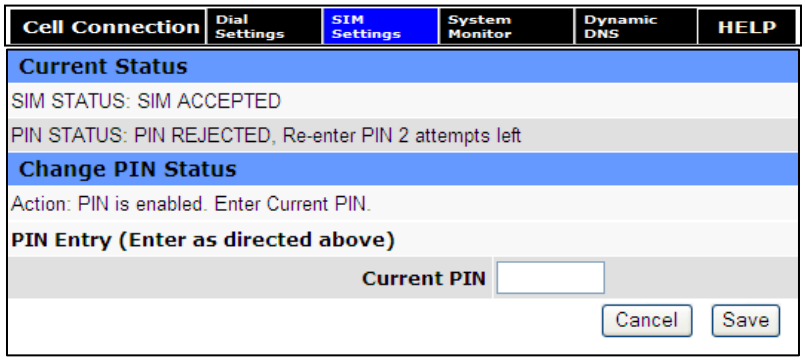
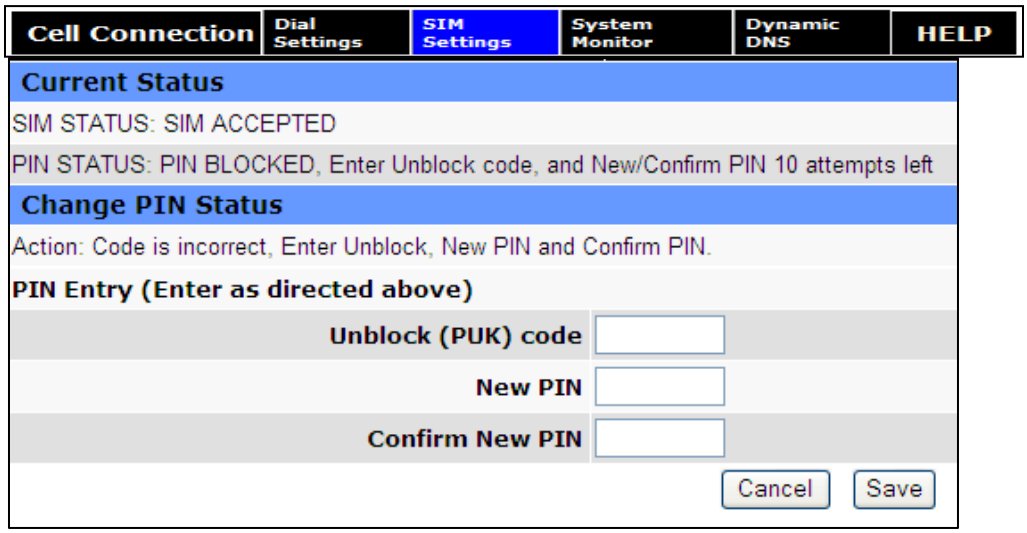


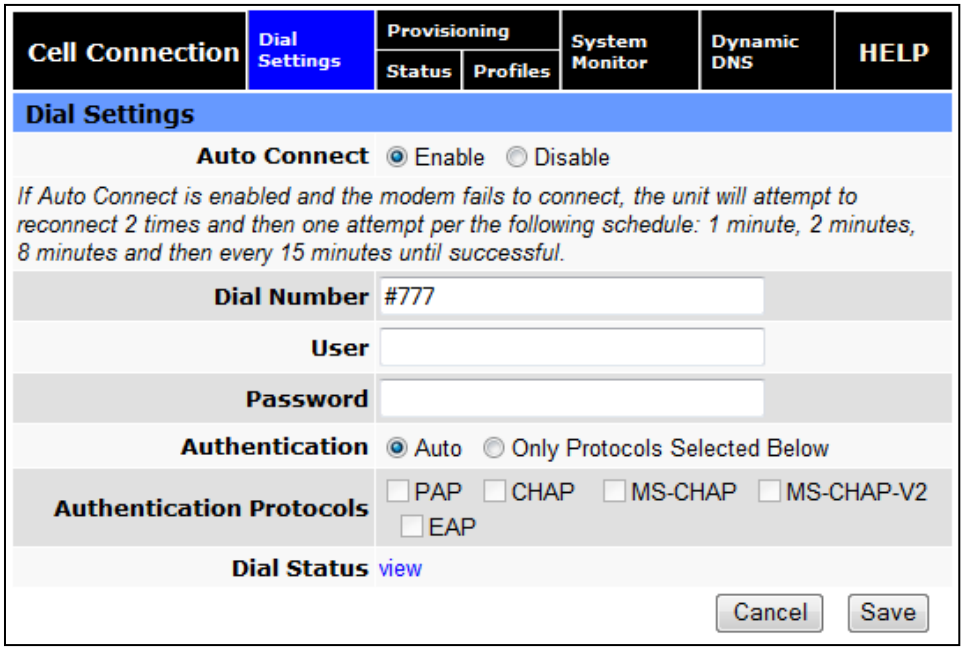
Figure 23 shows the SIM page requiring the unlock code to be entered. At this point the user has 10 attempts to enter the correct unlock code or the SIM card will be rendered unusable.

Figure 23: SIM PIN Unlock – Code Required



3.2.3 DIAL SETTINGS (CDMA MODELS)

Figure 24: Cell Connection – CDMA Dial Settings



Dial Settings

- **Auto Connect:**
  When set to Enable, will allow the modem to automatically dial the connection when the modem is powered. When set to Disable, the modem will not automatically dial the connection to the cellular provider and will not attempt to automatically re-connect when the connection has dropped.

- **Dial Number:**
  The phone number used to initiate a data connection to the cellular provider via PPP. The default dial number is #777.

- **User:**
  Sets the username required by the cellular provider. Leave blank if not required.Warning: If used in combination with this modem's VPN Server, this username and password will also be valid on this modem's VPN Server.

- **Password:**
  Sets the password required by the cellular provider. Leave blank if not required.Warning: If used in combination with this modem's VPN Server, this username and password will also be valid on this modem's VPN Server.

- **Authentication:**
  Selects the authentication protocol used. If Auto is selected, the Vanguard will automatically select a protocol. If Only Protocols Selected Below is chosen, then the router will only accept requests for the specified protocols.

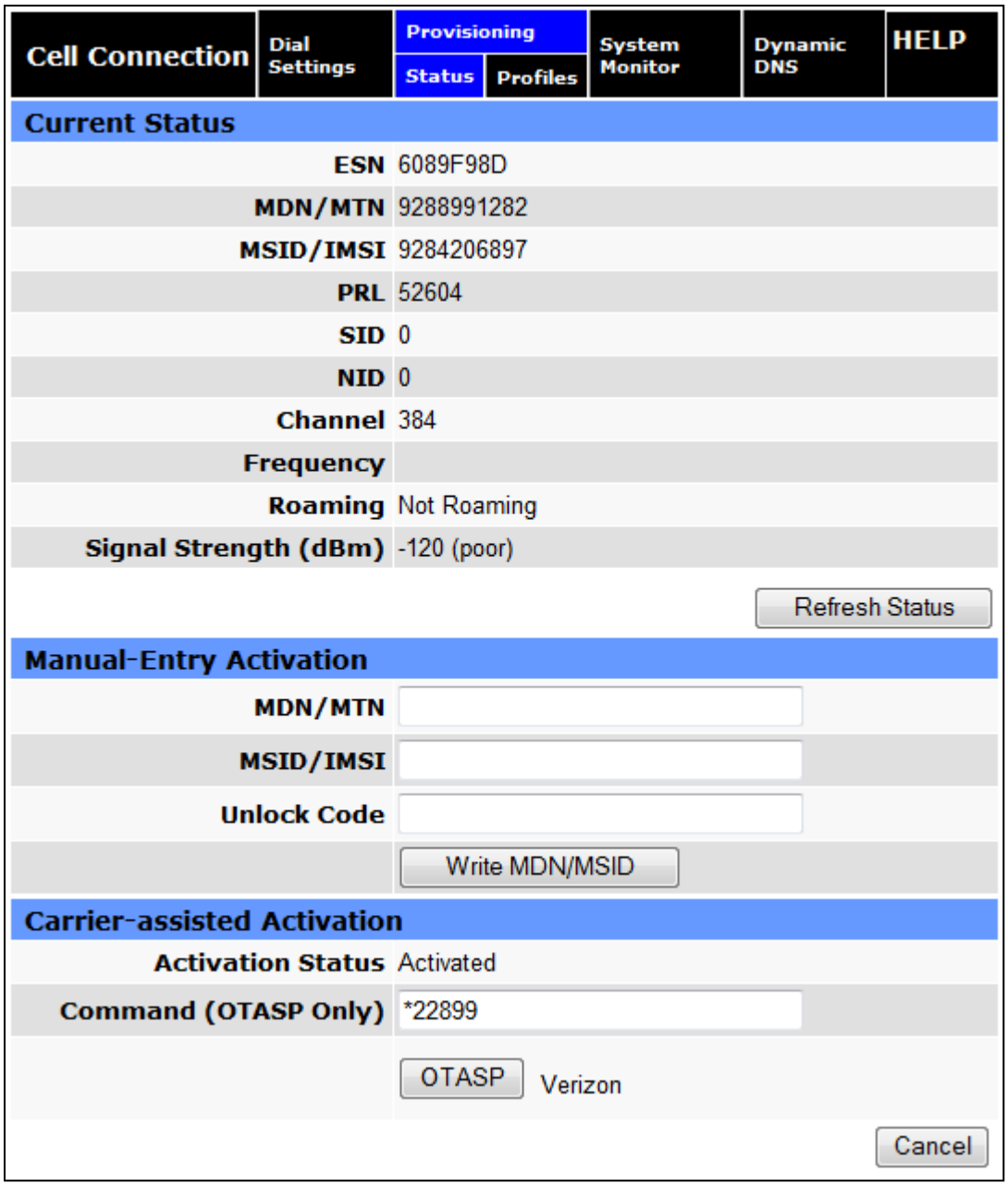
- **Authentication Protocols:**
  If Only Protocols Selected Below is chosen, then these fields are used to specify each Authentication protocol that router will accept. At least 1 must be selected. If Auto is selected, these choices will be disabled (greyed out).

- **Dial Status:**
  Click "view" to see a log from the last connection attempt.

3.2.4 PROVISIONING STATUS (CDMA MODELS)

When a new modem is powered up for the first time, most of the provisioning information is blank or has information that needs to be changed. The device is usually shipped with the radio ready to be provisioned on a cellular carrier’s network. Features called Over-The-Air Service Provisioning (OTASP) and Internet Over-The-Air (IOTA) are supported, which allow the cellular providers to program the modem with specific information to activate the account.

Figure 25: Cell Connection – Provision Status



Current Status

- **ESN:**
  The Electronic Serial Number is only applicable for the CDMA product line, carrier specific (Alltel, Verizon, Sprint, etc). This number is used to set up the user account with the cellular provider.

- **MDN/MTN:**
  The actual phone number of the device as supplied by the carrier. When the unit is successfully provisioned, the phone number for the user account will be displayed.

- **MIN/IMSI:**
  This number is used by the Mobile Telephone Network and will be different if ported from another carrier (not used by end user of device).

- **PRL:**
  Preferred Roaming List, only applicable for the CDMA product line, carrier specific (Alltel, Verizon, Sprint, etc).

- **SID:**
  System ID (Identity), provided by the Carrier.

- **NID:**
  Network Identifier, this is supplied automatically from the network.

- **Channel:**
  Cell Site channel number to which the modem is connected. This number can be useful to the cellular provider for troubleshooting purposes.

- **Frequency:**
  Cellular frequency band the modem is using, 800MHz and 1900MHz are mainly in the US and outlying areas. In some cases 900 and 1800 will be seen for European or Foreign carriers.

- **Roaming:**
  Options are either Roaming or Not Roaming and may defer from the PRL in the case of CDMA. For provisioning, the unit must NOT be roaming.

- **Signal Strength (dBm):**
  Measured in dBm, this is the Received Signal Strength Indicator (RSSI). For provisioning, the signal strength should be greater than -95 dBm.

Manual-Entry Activation

- **MDN/MTN:**
  The Mobile Directory Number assigned by the cellular provider for the specific ESN on the user account.

- **MSID/IMSI:**
  MSID, which only needs to be entered if different than the MDN.

- **Unlock Code:**
  A carrier supplied activation code (usually 6 or 7 digits for Sprint accounts).
  Click the Write MDN/MSID button when the required information has been entered.

Enable/Disable OMA-DM Activation

This section will only be displayed for units which are capable of automatic (OMA-DM) provisioning. You may choose to enable or disable the automatic provisioning and save your desired setting. If enabled, and the unit is not provisioned (activated), each time at power-on (only) the unit will attempt an auto-activation. This capability is dependant on whether or not it is offered by your cellular carrier.

- **Auto-Activation:**
  Choose Enable to direct an unprovisioned unit to attempt OMA-DM activation once per power-up.
  Click the SAVE button to save your desired setting after making a change.

Manual Initiation of OMA-DM Provisioning

This section will only be displayed for units which are capable of automatic (OMA-DM) provisioning. The activation status is displayed, and a button is provided to direct the unit to begin an OMA-DM provisioning attempt. Depending on changes to your carrier's network, it may be necessary to re-provision a unit that has already been activated. The OMA-DM capability is dependant on whether or not it is offered by your cellular carrier.

- **Activation Status:**
  Displays the activation status as Activated or Not Activated.
  Click the OMA-DM button to trigger an OMA-DM provisioning attempt.

Activation Type

This section is displayed for units that are not capable of automatic (OMA-DM) provisioning. Availability of OMA-DM is carrier dependant. For carriers that do not support OMA-DM, the provisioning process must be triggered by entering carrier specific information and depressing the carrier specified button (OTASP or IOTA).

Command (OTASP Only):
The dial command used for provisioning the modem. For OTASP the number is *22899. For IOTA this field is left blank.
Click the OTASP button to start the provisioning process for units using Verizon.
Click the IOTA button to start the provisioning process for units using Sprint.

3.2.4.1 VERIZON WIRELESS PROVISIONING INFORMATION (OTASP)

Verizon features Over-The-Air Service Provisioning (OTASP) which allows the cellular provider to provision the modem.

- Provisioning must occur in a non-roaming area of the Verizon network with a medium to strong signal strength.
- Select **Provisioning** from the side menu bar.
- Confirm the OTASP command reads ***22899**.
- Click the **OTASP** button.

If unsuccessful, follow the steps below to enter the information manually. Periodically, you should locally or remotely make sure to click on the OTASP button to ensure the PRL is updated. In some cases this may happen automatically by the carrier.

Manual-Entry Activation

- If provisioning must occur in a roaming area, make sure to have a medium to strong signal strength because manual-entry activation will be required.
- Select **Provisioning** from the side menu bar.
- Input the MDN/MTN and MSID/IMSI (MIN) given by your provider
- Put 6 0's (000000) for the unlock code
- Click the **Write MDN/MSID** button.

3.2.4.2 SPRINT PROVISIONING INFORMATION (OMA-DM)

Sprint features Open Mobile Alliance Device Management (OMA-DM) which allows the cellular provider to provision the modem.

After the account is activated by Sprint, the device will auto-provision after power is applied to the device for the first time. First, verify on the Home page the MDN/MTN and MSID/IMSI/MIN are in the default mode. Then after 3-4 minutes, check again that the MDN/MTN and MSID/IMSI/MIN are populated with the numbers provided by the carrier. Once this is complete, you can move on to the next section. If auto-provisioning doesn't occur, push the OMA-DM button to provision. If both of these are unsuccessful, follow the steps below to deactivate auto-provisioning and enter the information manually.

- **Provisioning must occur in a non-roaming area of the Sprint network with a medium to strong** signal strength.
- Select **Provisioning** from the side menu bar.
- Sprint is capable of automatic OMA-DM provisioning. The Auto Activation can be Enabled or Disabled. To save the Auto Activation, click the SAVE button.
- If Auto Activation is Disabled, a manual initiation of OMA-DM can be started by clicking on the OMA-DM button
- If the auto-provisioning fails, and OMA-DM manual provisioning fails, and your outside the Sprint network, follow the manual-entry activation steps below.

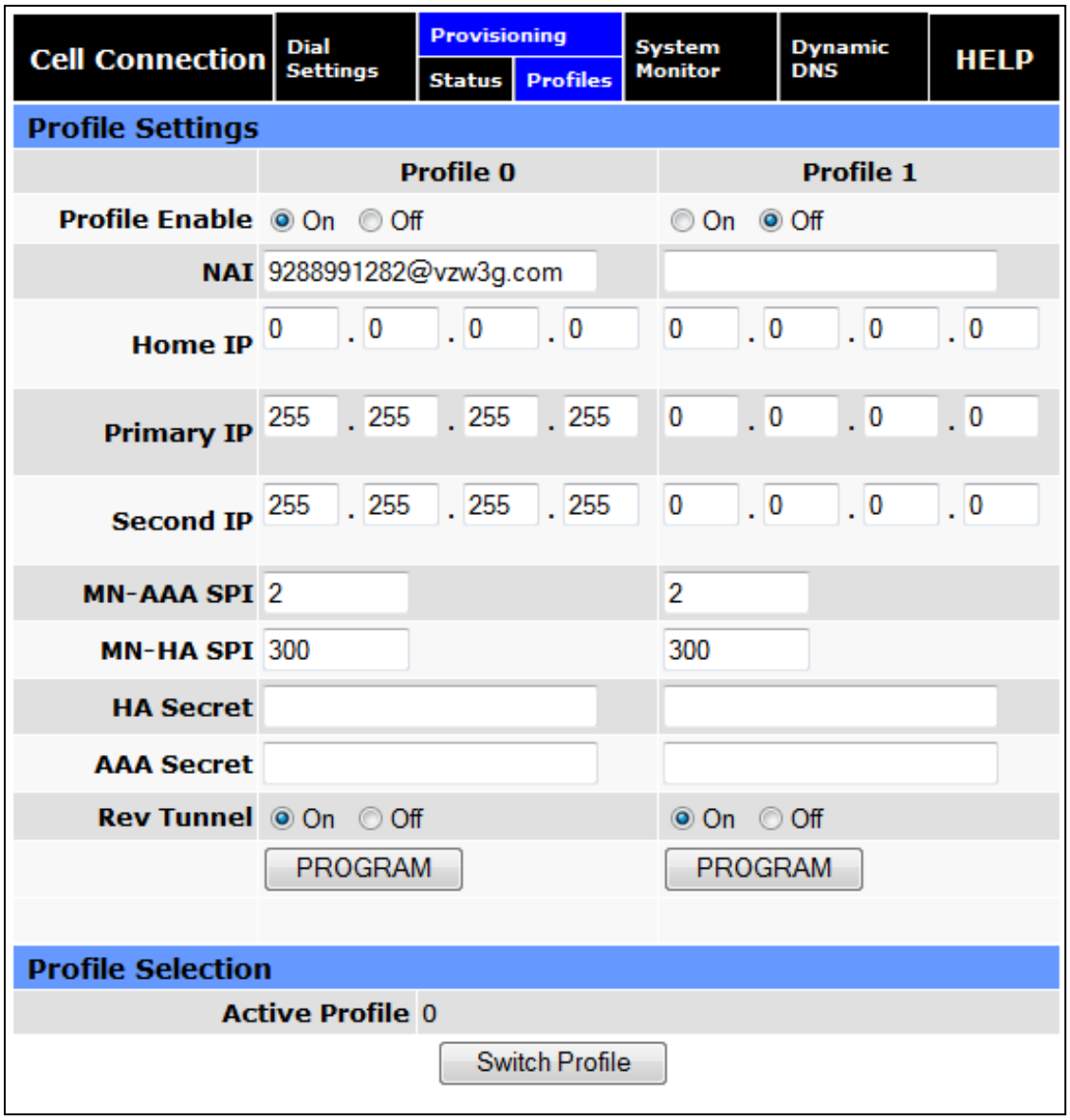
Manual-Entry Activation

- If provisioning must occur in a roaming area, make sure to have a medium to strong signal strength because manual-entry activation will be required.
- Select **Provisioning** from the side menu bar.
- Input the MDN/MTN and MSID/IMSI (MIN) given by your provider.
- Put in the unlock code given by your provider.
- Click the **Write MDN/MSID** button.

3.2.5 PROVISIONING PROFILES (CDMA MODELS)

The Provider NAI page supports the programming of 2 profiles that may be used to login to the cellular provider's network. It also allows the user to choose which profile is active.A provider may support alternate networks whose use is limited to specific customers. Login information must be gathered from the provider. Be aware that incorrect parameter settings could result in no access to the standard network, and no access to the alternate network.

Figure 26: Cell Connection – Provision Profiles



Profile Settings

- **Profile Enable:**
  This field indicates if the profile is enabled. It is possible to enable both profiles. Whether to enable 1 or both profiles should be based on information from the provider.

- **NAI:**
  This field should be set the the Network Access ID supplied by the provider.

- **Home IP Address:**
  This parameter should be set to the Home IP Address supplied by the provider.

- **Primary IP Address:**
  This parameter should be set to the Primary Home Agent IP Address supplied by the provider.

- **Secondary IP Address:**
  This parameter should be set to the Secondary Home Agent IP Address supplied by the provider.
- **MN-AAA SPI:**
  This parameter should be set to the MN-AAA SPI setting supplied by the provider. This is a numeric setting.

- **MN-HA SPI:**
  This parameter should be set to the MN-HA SPI setting supplied by the provider. This is a numeric setting.

- **Home Agent Secret:**
  This parameter should be set to the Home Agent Secret (password) supplied by the provider.

- **AAA Secret:**
  This parameter should be set to the AAA Shared Secret (password) supplied by the provider.

- **Reverse Tunneling:**
  Reverse Tunneling may be enabled or disabled, as specified by the provider.

- **Program:**
  Pressing the program button will prompt you to confirm you wish to program the current displayed settings. If confirmed, the settings will be programmed and the unit will reboot.

- **Active Profile:**
  Displays which profile is active. The field cannot be modified, instead press the Change button to select the other profile.

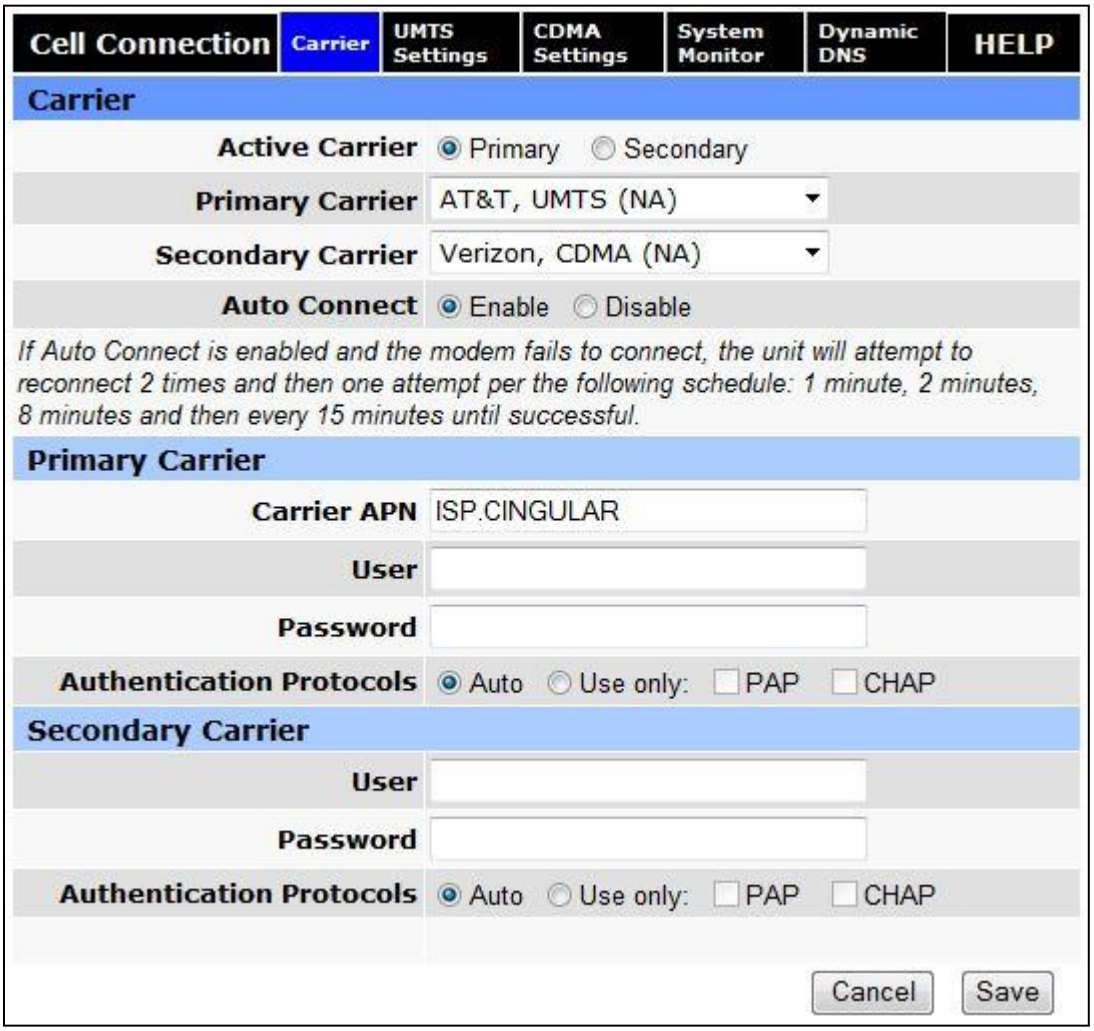
- **Switch Profile:**
  Pressing the Switch Profile button will prompt you to confirm you wish to switch to activate the other profile. If confirmed, the other profile will be selected and the unit will reboot.

3.3 CELL CONNECTION – VANGUARD 3000

Select **Cell Connection** from the left navigation pane to access the carrier, UMTS, CDMA, system monitor and dynamic DNS settings screen.

3.3.1 CARRIER

Figure 27: Cell Connection – Carrier



Carrier

- **Active Carrier**
  elects which carrier and credentials to use for data calls. The Secondary Carrier cannot be selected if it is “None”. (Changing carriers takes time and the page may take up to one minute to refresh after Save is clicked.)

- **Primary Carrier**
  A list of carriers and their cellular protocols (UMTS/CDMA) and regions (Global, North America, Europe). Select the appropriate carrier. It cannot be the same as the Secondary Carrier. UMTS carriers require that a proper SIM be installed.

- **Secondary Carrier**
  A list of carriers and their cellular protocols (UMTS/CDMA) and regions (Global, North America, Europe) or None. Select the appropriate carrier. It cannot be the same as the Primary Carrier. UMTS carriers require that a proper SIM be installed.

- **Auto Connect**
  When set to Enable, will allow the modem to automatically dial the connection when the modem is powered. When set to Disable, the modem will not automatically dial the connection to the cellular provider and will not attempt to automatically re-connect when the connection has dropped.

Primary/Secondary Carrier

- **Carrier APN**
  This field is visible only when the corresponding carrier supports UMTS. Enter the APN provided by the carrier.

- **User**
  Sets the username required by the cellular provider. Leave blank if not required. Warning: If used in combination with this modem's VPN Server, this username and password will also be valid on this modem's VPN Server.

- **Password**
  Sets the password required by the cellular provider. Leave blank if not required. Warning: If used in combination with this modem's VPN Server, this username and password will also be valid on this modem's VPN Server.

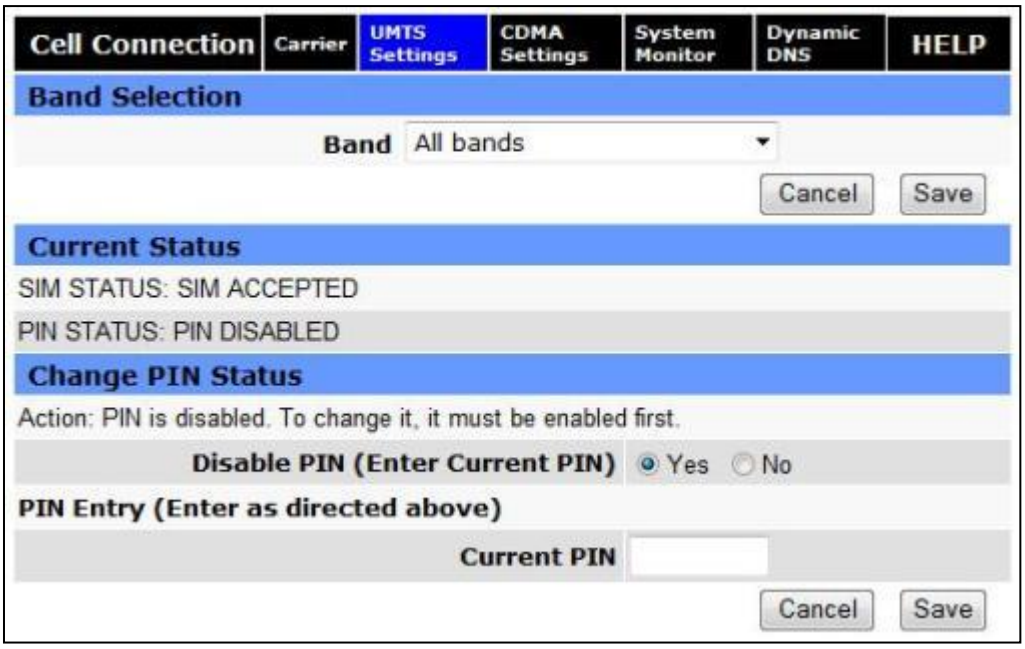
- **Authentication Protocols**
  Selects the authentication protocol used. If Auto is selected, the Vanguard will negotiate a protocol with the cell tower. If Use Only is chosen, then the Vanguard will only accept requests for the specified protocols.

3.3.2 UMTS SETTINGS

When the Active Carrier supports UMTS, the fields on this page will be enabled. A specific Band of operation can be chosen and various SIM settings can be changed.

One of the key features of GSM (UMTS) is the Subscriber Identity Module (SIM), commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information. This allows the user to retain his or her information after switching handsets. The SIM has a security feature which, when enabled, will require the user to enter a valid PIN before the modem will connect to the cellular network.

Figure 28: Cell Conection – UMTS Settings



Band Selection

- **Band**
  A list of frequency bands appropriate for the Active Carrier. Select a specific band or (recommended) select All Bands.

Current Status

- **SIM STATUS**
  "SIM ACCEPTED" will display if a valid SIM card is inserted properly into the modem.
  "NO SIM, Insert Valid SIM and Press Reset" will display if the SIM card is invalid or missing.

- **PIN STATUS**
  "PIN DISABLED" will display when the PIN security is not enabled.

Change PIN Status – Disable PIN

Action: "PIN disabled. To change it, it must be enabled first" will be displayed when the PIN security is not enabled.

Disable PIN (Enter Current PIN)
Select Yes to disable the PIN security feature. Select No to enable PIN security for the modem. After selecting No, the current PIN should be entered in the Current PIN: field. Click on the Save button to finish enabling PIN security.

"PIN ACCEPTED" will display when the PIN security is enabled.
Action: You may change only one of the following 3 options at a time. Three choices are given to Remember, Disable, or Change the PIN security settings.

Remember PIN (Enter Current PIN)
Selecting Yes will allow the modem to remember the security PIN making it unnecessary to enter the PIN each time the modem tries to connect to the network. Selecting No will set the modem to not remember the current PIN, requiring the user to enter the PIN when requested.

Disable PIN (Enter Current PIN)
Selecting Yes will disable the PIN security feature; the current PIN will need to be entered to allow disabling. Selecting No will not disable the PIN security feature.

Change PIN (Enter Current PIN, New PIN, and Confirm PIN)
Selecting Yes will allow the user to change the current PIN to a new one. Selecting No will not require the user to change the PIN in the New PIN and Confirm PIN fields. After changes have been made, click on the Save button to finish.

"PIN Entry Required" will display when the PIN security is enabled and set not to remember the PIN.

PIN
A field is provided for the user to enter the valid PIN. The user will have a total of 3 opportunities to enter the correct PIN.

"Unknown" will display if the SIM card is not detected.

"SIM Invalid" will be displayed if the SIM card is not detected.

Change PIN Status – PIN Entry

- **Current PIN**
  Field to enter the current valid PIN if PIN security is enabled. Also used to enable PIN security after the user selects No to Disable PIN security.

- **New PIN**
  Field to enter the new PIN if PIN security is enabled.

- **Confirm New PIN**
  Field to enter and confirm the new PIN if PIN security is enabled.

3.3.3 CDMA SETTINGS

When the Active Carrier supports CDMA, the fields on this page will be enabled. A specific Band of operation can be chosen and new modem can be provisioned.

When a new modem is powered up for the first time, most of the provisioning information is blank or has information that needs to be changed. The device is usually shipped with the radio ready to be provisioned on a cellular carrier's network. Features called Over-The-Air Service Provisioning (OTASP) and Open Mobile Alliance Device Management (OMA-DM) are supported, which allow the cellular providers to program the modem with specific information to activate the account.

Figure 29: Cell Connection – CDMA Settings

Band Selection

- **Band**
  A list of frequency bands appropriate for the Active Carrier. Select a specific band or (recommended) select All Bands.

Current Status

- **MEID**
  The Mobile Equipment Identifier is used by the cellular carrier as the means to identify the cellular module. This is the identifier is used to set up the user account with the cellular provider.

- **MDN/MTN**
  The actual phone number of the device as supplied by the carrier. When the unit is successfully provisioned, the phone number for the user account will be displayed.

- **MIN/IMSI**
  This number is used by the Mobile Telephone Network and will be different if ported from another carrier (not used by end user of device).

- **PRL**
  Preferred Roaming List, only applicable for the CDMA product line, carrier specific (Alltel, Verizon, Sprint, etc).

- **SID**
  System ID (Identity), provided by the Carrier.

- **NID**
  Network Identifier, this is supplied automatically from the network.

- **Channel**
  Cell Site channel number to which the modem is connected. This number can be useful to the cellular provider for troubleshooting purposes.

- **Frequency**
  Cellular frequency band the modem is using, 800MHz and 1900MHz are mainly in the US and outlying areas. In some cases 900 and 1800 will be seen for European or Foreign carriers.

- **Roaming**
  Will be either Roaming or Not Roaming. Roaming indicates service is being provided by an alternate carrier who has a roaming agreement with your contracted carrier. While Roaming, additional charges may apply. For provisioning, the unit must be Not Roaming.

- **Signal Strength (dBm)**
  Measured in dBm, this is the Received Signal Strength Indicator (RSSI). For provisioning, the signal strength should be greater than -95 dBm.

Enable/Disable OMA-DM Activation

This section will only be displayed for units which are capable of automatic (OMA-DM) provisioning. Sprint supports OMA-DM. You may choose to enable or disable the automatic provisioning and save your desired setting. If enabled, and the unit is not provisioned (activated), each time at power-on (only) the unit will attempt an auto-activation. This capability is dependant on whether or not it is offered by your cellular carrier.

- **Auto-Activation**
  Choose Enable to direct an unprovisioned unit to attempt OMA-DM activation once per power-up.

Click the SAVE button to save your desired setting after making a change.

Manual Initiation of OMA-DM Provisioning

This section will only be displayed for units which are capable of automatic (OMA-DM) provisioning. The activation status is displayed, and a button is provided to direct the unit to begin an OMA-DM provisioning attempt. Depending on changes to your carrier's network, it may be necessary to re-provision a unit that has already been activated. The OMA-DM capability is dependant on whether or not it is offered by your cellular carrier.

- **Activation Status**
  Displays the activation status as Activated or Not Activated.

Click the OMA-DM button to trigger an OMA-DM provisioning attempt.

- **Activation Type**
  This section is displayed for units that are not capable of automatic (OMA-DM) provisioning. Availability of OMA-DM is carrier dependant. For carriers that do not support OMA-DM, the provisioning process must be triggered by entering carrier specific information and depressing the carrier specified button (OTASP).

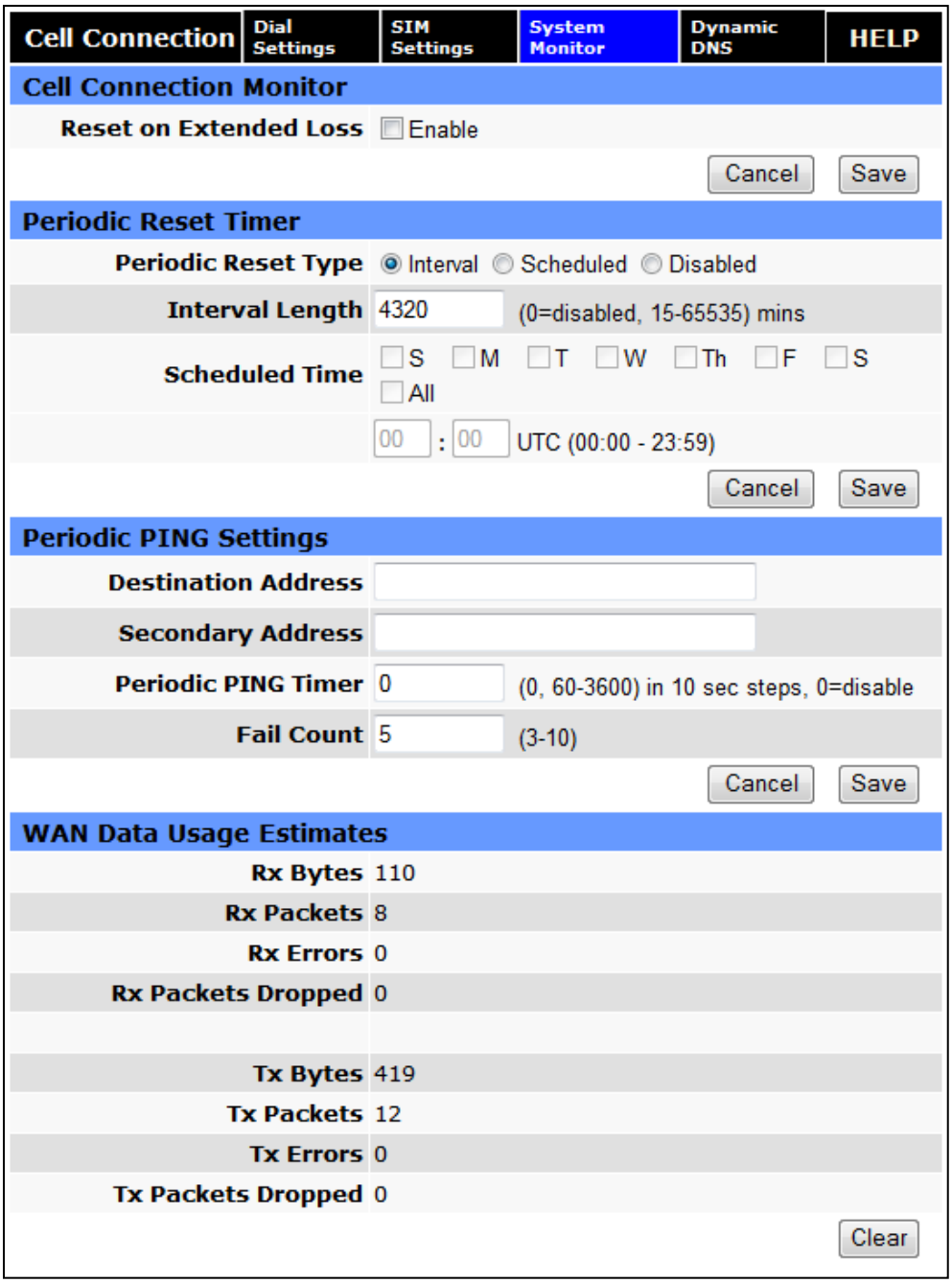
- **Command (OTASP Only)**
  The dial command used for provisioning the modem. For OTASP the number is *22899.

Click the OTASP button to start the provisioning process for units using Verizon.

3.3.4 SYSTEM MONITOR

Select **Cell Connection** from the left navigation pane. The System Monitor tab allows user access to the configuration of additional self-monitoring for the modem to determine when service provider connections may have been terminated.

Figure 30: Cell Connection – System Monitor



Cell Connection Monitor

- **Reset on Extended Loss**
  Fixed-point connections expect to have consistent access to the cellular network, compared to mobile connections that may temporarily lose access depending on coverage. This option causes the modem to reset if the cell connection is lost for more than 90 seconds.

Periodic Reset Timer

- **Periodic Reset Type**
  Sets the Periodic Modem Reset timer to an Interval time, a Scheduled day, or disables it.

- **Interval Length**
  Sets the Periodic Modem Reset time from 15 to 65,535 minutes. The Periodic Reset is disabled when set to 0. Default is set to 4320 min. (approximately 3 days)

- **Scheduled Time**
  Sets the Periodic Modem Reset to occur at the specified time. Select the days of week desired or 'All' for everyday. Time is specified as Local Time, based on the location of the modem itself. The modem's current time is shown on the "home" page.

Periodic Ping Settings

- **Destination Address**
  User may enter an accessible IP address or URL that will respond to a ping command.

- **Secondary Address**
  User may enter an accessible IP address or URL that will respond to a ping command. This address will be used if the entered number of consecutive ping failures using the first address is reached.

- **Periodic Ping Timer**
  User may enter an interval in increments of 10 seconds. The modem will ping the destination at that interval. Enter 0 to disable this feature.

- **Fail Count**
  The modem will reset if the number of consecutive ping failures is equal to or greater than this entry and the secondary address is being used. Otherwise the modem will switch from the first address to the secondary address for the ping test.

WAN Data Usage Estimates

This section tracks the data received from and transmitted to the cellular network. This is a tool that may be used to estimate network usage. These totals are tracked by the router. Your carrier maintains separate statistics from which your billing is determined. One way to use this tool is to track usage over a fairly short period of typical usage. The total then can be extrapolated to estimate longer time periods. This router updates these statistics once approximately every 30 seconds. Press the Clear button to reset the totals to 0.

- **Rx Bytes:**
  The total number of bytes received by the modem from the cell network. All statistics will be cleared automatically if this count exceeds 1 billion (1,000,000,000).

- **Rx Packets:**
  The total number of TCP and UDP packets received by the modem from the cell network.

- **Rx Errors:**
  The number of corrupted TCP and UDP packets received by the modem from the cell network.

- **Rx Packets Dropped:**
  The number of TCP and UDP packets received by the modem from the cell network that were not accepted. This may occur due to memory or throughput problems.

- **Tx Bytes:**
  The total number of bytes transmitted by the modem to the cell network. All statistics will be cleared automatically if this count exceeds 1 billion (1,000,000,000).

- **Tx Packets:**
  The total number of TCP and UDP packets transmitted by the modem to the cell network.

- **Tx Errors:**
  The number of corrupted TCP and UDP packets received by the modem that were meant to be transmitted on the cell network.

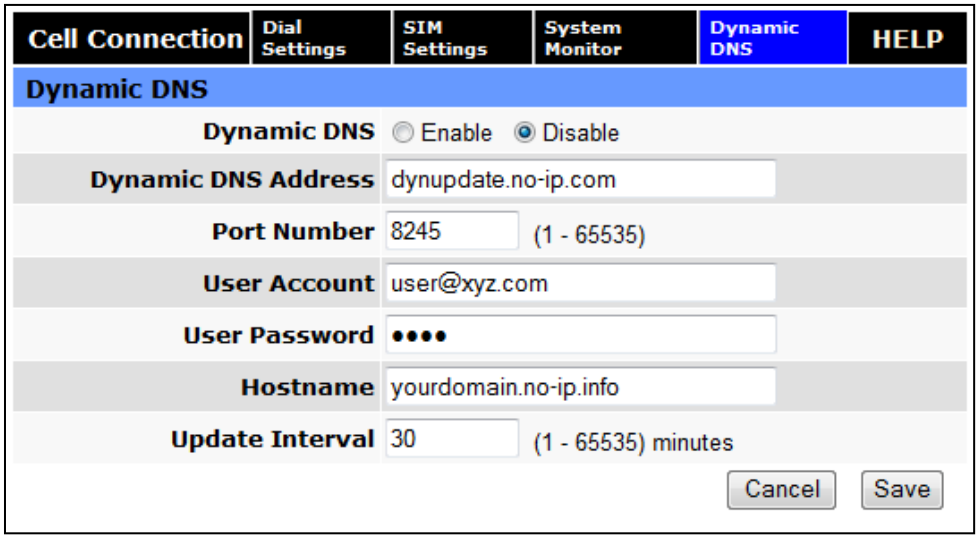
- **Tx Packets Dropped:**
  The number of TCP and UDP packets received by the modem for transmit to the cell network that were not accepted. This may occur due to memory or throughput problems.

Press the **Clear** button to reset the totals to 0. These totals are NOT cleared by a modem reboot.

3.3.5 DYNAMIC DNS

Select **Cell Connection** from the left navigation pane. Select the Dynamic DNS tab to open the Dynamic DNS configuration page. Dynamic DNS is a system which allows the domain name data of a computer with a varying (dynamic) IP addresses held in a name server to be updated in real time in order to make it possible to establish connections to that machine without the need to track the actual IP address themselves at all times. A number of providers offer Dynamic DNS services ("DDNS"), free or for a charge. For example, a free service provided by NO-IP allows users to setup between one and five host names on a domain name provided by NO-IP. No-IP is the default DNS service.

Figure 31: Cell Connection – Dynamic DNS



Dynamic DNS

- **Dynamic DNS**
  Selecting Enable will allow the modem to provide the selected service dynamic IP address information. Selecting Disable will stop any IP information from being sent to the selected service.

- **Dynamic DNS Address**
  The internet address to communicate the Dynamic DNS information to. Default is dynupdate.no-ip.com.

- **Port Number**
  The port number for the internet address give above. Default is 8245.

- **User Account**
  The username used when setting up the account. Used to login to the Dynamic DNS service.

- **User Password**
  The password associated with the username account.

- **Hostname**
  The hostname identified to the Dynamic DNS service. For example http:/test.myserver.com.

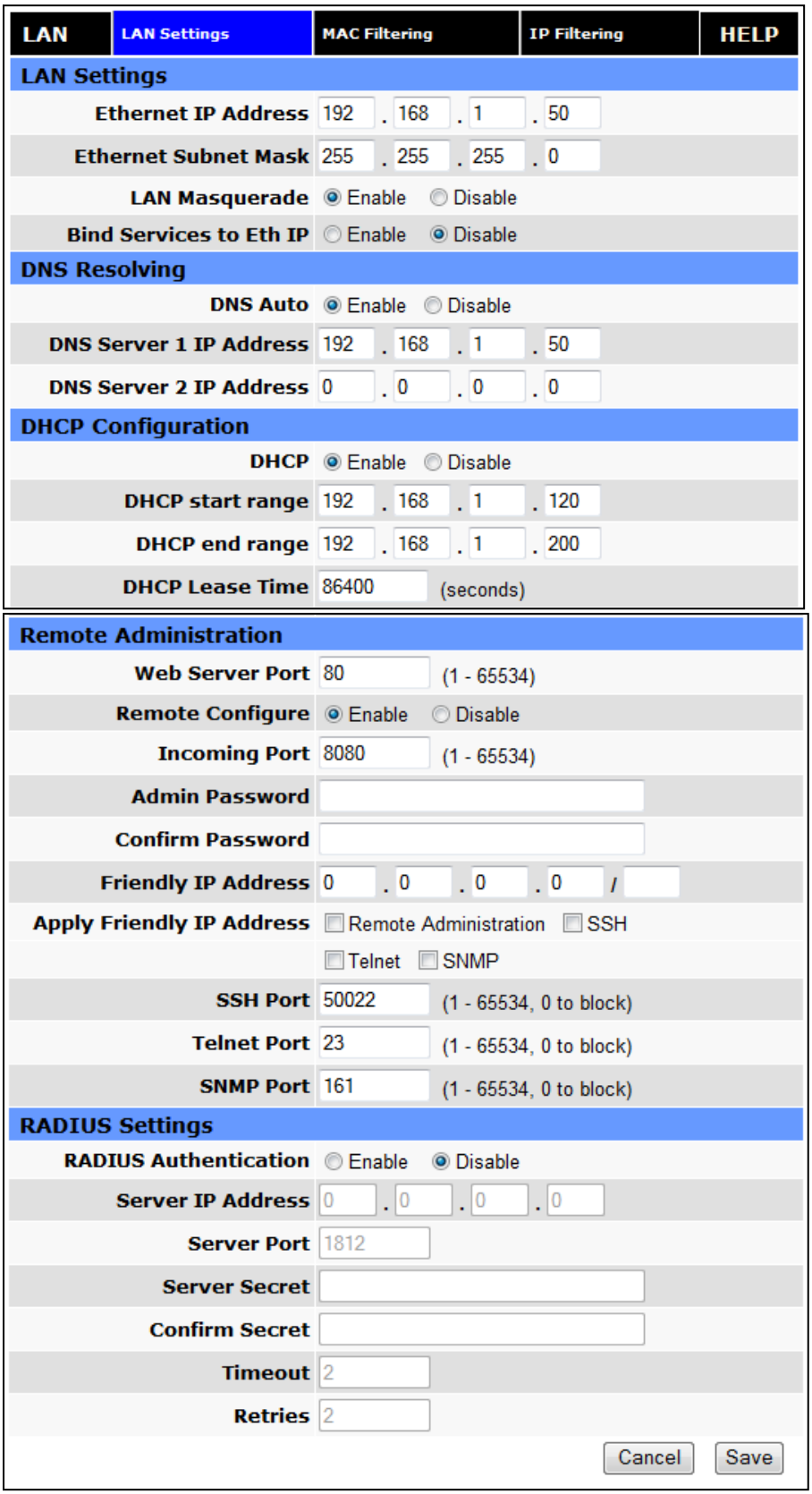
- **Update Interval**
  Sets the interval, in minutes (0 to 65,535), the modem will update the Dynamic DNS server of its carrier assigned IP address. It is recommended to set this interval as long as necessary. Each update is considered a data call by the cellular provider and could deplete low usage data plan minutes.

The **SAVE** button must be pressed for changes to take effect.

3.4 LAN SETTINGS

Select **LAN Settings** from the main navigation pane for access to LAN configuration settings and the MAC Filtering tab.

Figure 32: LAN – LAN Settings


LAN
LAN Settings
MAC Filtering
IP Filtering
HELP
LAN Settings
Ethernet IP Address 192 . 168 . 1 . 50
Ethernet Subnet Mask 255 . 255 . 255 . 0
LAN Masquerade Enable Disable
Bind Services to Eth IP Enable Disable
DNS Resolving
DNS Auto Enable Disable
DNS Server 1 IP Address 192 . 168 . 1 . 50
DNS Server 2 IP Address 0 . 0 . 0 . 0
DHCP Configuration
DHCP Enable Disable
DHCP start range 192 . 168 . 1 . 120
DHCP end range 192 . 168 . 1 . 200
DHCP Lease Time 86400 (seconds)
Remote Administration
Web Server Port 80 (1 - 65534)
Remote Configure Enable Disable
Incoming Port 8080 (1 - 65534)
Admin Password
Confirm Password
Friendly IP Address 0 . 0 . 0 . 0 /
Apply Friendly IP Address Remote Administration SSH
Telnet SNMP
SSH Port 50022 (1 - 65534, 0 to block)
Telnet Port 23 (1 - 65534, 0 to block)
SNMP Port 161 (1 - 65534, 0 to block)
RADIUS Settings
RADIUS Authentication Enable Disable
Server IP Address 0 . 0 . 0 . 0
Server Port 1812
Server Secret
Confirm Secret
Timeout 2
Retries 2
Cancel
Save

LAN Settings

- **Ethernet IP Address**
  This sets the IP address of this device and is the address used to access the configuration pages. If the IP address changes you will have to re-enter the new IP address in your browser to access the configuration pages. The default IP is 192.168.1.50 and should be changed for security purposes.

- **Ethernet Subnet Mask**
  Sets the subnet mask for the LAN side of the modem to the device

- **LAN Masquerade**
  When enabled the Vanguard SC masquerades all Ethernet traffic to the LAN, making all WAN traffic appear as if it originated from the Vanguard SC. This can be useful in applications where less-capable equipment on the local LAN cannot cope with connections from multiple Host IP addresses

- **Bind Services to Eth IP**
  UDP datagrams or TCP sockets from services inside the Vanguard SC (Serial, IO, GPS) normally appear to come from the interface (LAN or WAN) closest to the destination. Enable this option to force the source address to be the LAN Ethernet IP address. This can be useful if packets are being sent through a VPN tunnel. Note that outside of a tunnel, NAT may still force the source address to be rewritten to the WAN address.

DNS Resolving

- **DNS Auto**
  Selecting Enable will allow the servers set as DNS Server 1 or 2 to automatically resolve domain names to IP addresses. These servers communicate with name servers by sending DNS queries and heeding DNS responses. Selecting Disable will not allow DNS Sever 1 or 2 to resolve domain names.

- **DNS Server 1 IP Address**
  The Ethernet IP address of the preferred DNS server. The default address is 192.168.1.50, the same as the LAN Ethernet IP Address for the modem. If the LAN Ethernet ID Address changes, the DNS Server 1 address will automatically change to the same.

- **DNS Server 2 IP Address**
  Ethernet address of the alternate DNS server. The default is set to 0.0.0.0.

DHCP Configuration

- **DHCP**
  Dynamic Host Configuration Protocol; a protocol used by client devices that are connected to the LAN port of this device to automatically obtain an IP address assigned by this device. Selecting Enable will configure this device to assign IP addresses to client devices taken from a pool specified by the values entered in DHCP start range and DHCP end range. Selecting Disable will turn off this DHCP server functionality

- **DHCP start range**
  DHCP server starting IP address. The default is set as 192.168.1.100

- **DHCP end range**
  DHCP server ending IP address. The maximum usable number is 253

- **DHCP Lease Time**
  Sets the duration, in seconds, the connected device is allowed to keep the assigned IP address. In many cases it is possible for the device to receive the same IP address after the lease time expires.

Remote Administration

- **Web Server Port**
  Enter the port number to be used by the web server

- **Remote Configure**
  Selecting Enable will allow remote access to the modem's configuration screens through the cellular network connection. Selecting Disable will shut off the ability to remotely access the modem's configuration screens

- **Incoming Port**
  Sets the port number used to remotely configure the modem. (Note: Remote Configuration will be unavailable if the Incoming Port number also appears in an entry in Router | Port Forwarding | IP Mapping Table.)

- **Admin Password**
  Sets the password required for remote configuration

- **Confirm Password**
  Re-type the Admin Password to confirm the correct spelling

- **Friendly IP Address**
  Specifies the IP address from which remote administration is permitted. Entering 0.0.0.0 will allow any IP address. Leave the fifth box blank (after the /) if specifying a specific IP, or 0.0.0.0. A subnet mask may be entered in the fifth box. The mask indicates how many bits of the IP address to match. This can be a value from 1 to 32.

- **Apply Friendly IP Address**
  Check the box next to a service to allow remote access to the service only from the friendly IP address. Uncheck this box to allow any IP address access.

- **SSH, Telnet, and SNMP Ports**
  Enter the port number that will be used for remote access to the service. Entering zero for the port number will block remote access to the service. Once a service is blocked (0 entered) or moved to another port, the default port number (such as 23 for Telnet) can be used in a Port Forwarding rule to provide access to a user device located behind the modem. Port Forwarding has precedence so if the SSH, Telnet or SNMP port also appears as an Incoming Port in an entry in Router | Port Forwarding | IP Mapping Table then that service will be unavailable.

RADIUS Settings

- **RADIUS Authentication**
  Enable or disable RADIUS authentication for webpage access

- **Server IP Address**
  The IP address of the RADIUS server

- **Server Port**
  The port of the server

- **Server Secret**
  Sets the secret to use with the server

- **Confim Secret**
  Re-type the Server Secret to confirm the correct spelling

- **Timeout**
  Specify how many seconds to wait before a retry

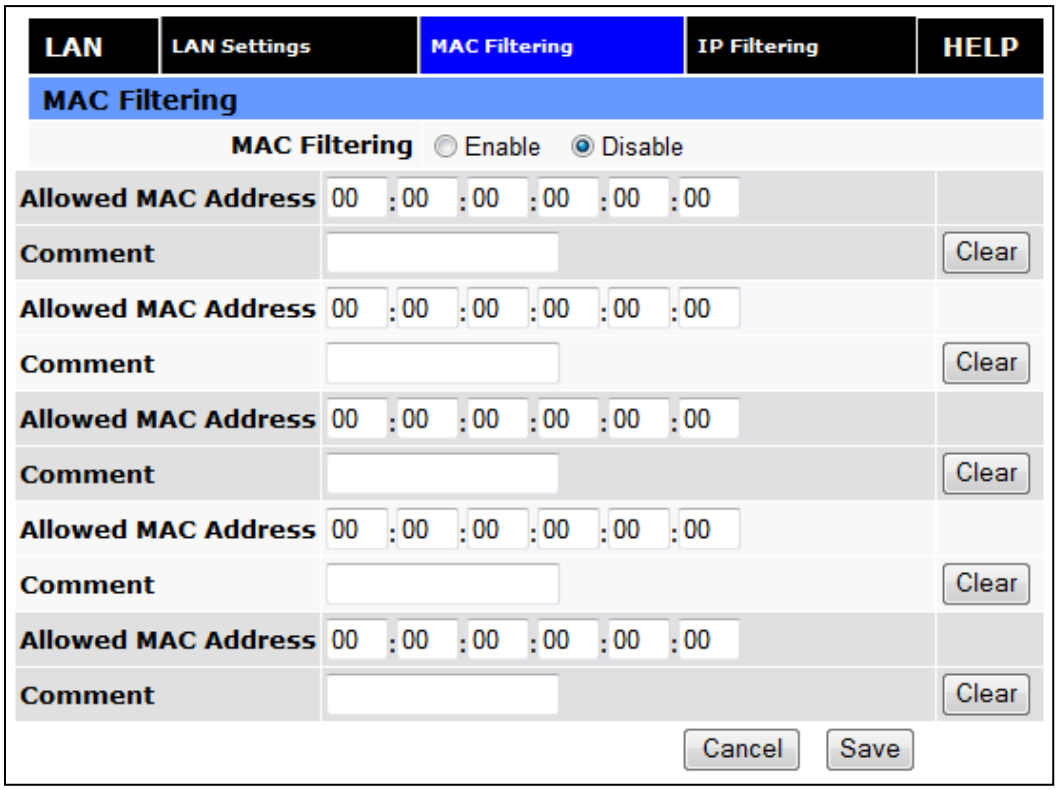
- **Retries**
  Specify how many times to retry authenticating with the server before giving up

Press **Save** to keep the currently displayed value for each parameter. Once Save is pressed, Cancel cannot be used to return to previous settings. Press **Cancel** to abort changes and redisplay the last saved parameters for this page.

3.4.1 MAC FILTERING

Select **LAN Settings** from the left navigation pane. The MAC Filtering tab opens the MAC filtering configuration page. MAC filtering allows up to five unique device MAC addresses access to the network.

Figure 33: LAN – MAC Filtering



MAC Filtering

- **MAC Filtering**
  Radio button selection to Enable/Disable MAC filtering

- **Allowed MAC Address**
  Enter the MAC address for a device to be allowed on the network.

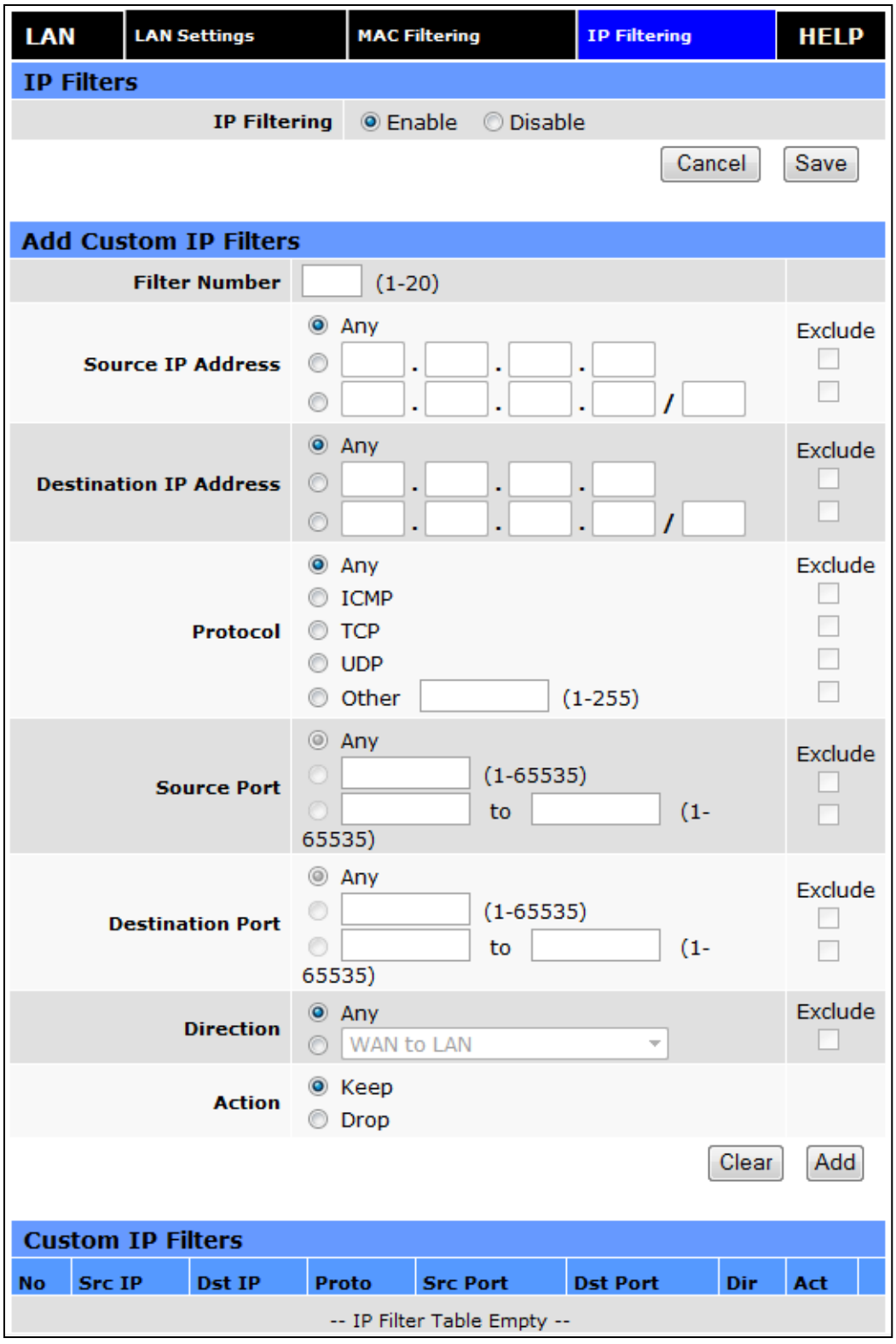
- **Comment**
  Here a name can be inserted describing the device using the allowed MAC address.

- **Clear**
  Press to remove the MAC address from the list of allowed addresses.

Press **SAVE/CANCEL** to implement or cancel changes.

3.4.2 IP FILTERING

Figure 34: LAN – IP Filtering



The "IP Filtering" page is used to configure IP filters.

The user can enter up to 20 IP filters. Each IP filter is identified by a unique number (from 1 to 20). An IP packet goes through the filtering logic when IP filtering is enabled and:

1) An IP packet is received on one of the interface and is destined to the Vanguard unit
   OR
2) An IP packet is sent by the Vanguard unit
   OR
3) An IP packet is forwarded by the Vanguard unit.

The filtering logic is the following:

```
if exists(filter[1]) AND match(packet, filter[1]) then apply(action[1])
else if exists(filter[2]) AND match(packet, filter[2]) then apply(action[2])
else if exists(filter[3]) AND match(packet, filter[3]) then apply(action[3])

else if exists(filter[20]) AND match(packet, filter[20]) then  apply(action[20])
else process packet normally.
```

Where:

exists(filter[n]) -> The user as defined filter number n.
match(packet, filter[n]) -> The IP packet matches filter number n.
apply(action[n]) -> The action identified in filter number n.

IP Filters

- **IP FIltering:**
  Enable : IP filtering is enabled. Any custom IP filters entered by the user will be taken into account when processing IP packets. The predefined IP filters will also be taken into account.
  Disable : IP filtering is disabled.

Add Custom IP Filters

- **Filter Number:**
  Each IP filter is identified by a unique number from 1 to 20.

- **Source IP Address:**
  Any: Any source IP Address will satisfy this criteria.
  Specific :A specific Host IP address.
  Range : A range of IP addresses.

  If the Exclude field is checked, it means that in order for the packet to match with this criteria, it must NOT have this source IP address (or NOT be in the given source IP address range).

- **Destination IP Address:**
  Any : Any destination IP Address will satisfy this criteria.
  Specific :A specific Host IP address.
  Range : A range of IP addresses.

  If the Exclude field is checked, it means that in order for the packet to match with this criteria, it must NOT have this destination IP address (or NOT be in the given destination IP address range).

- **Protocol:**
  Any : Any protocol number.
  ICMP : The ICMP protocol (1).
  TCP : The TCP protocol (6).
  UDP : The UDP protocol (17).
  Other : Any other IP protocol.

  If the Exclude field is checked, it means that in order for the packet to match with this criteria, it must NOT have this protocol number.

- **Source Port:**
  Any : Any source port number.
  Specific : Select a specific source port number.
  Range : Select a range of source port number.

  If the Exclude field is checked, it means that in order for the packet to match with this criteria, it must NOT have this source port number (or NOT be in the given source port number range).

- **Destination Port:**
  Any : Any destination port number.
  Specific : Select a specific destination port number.
  Range : Select a range of destination port number.

  If the Exclude field is checked, it means that in order for the packet to match with this criteria, it must NOT have this destination port number (or NOT be in the given destination port number range).

- **Direction:**
  The direction corresponds to the path taken by the IP packet inside the Vanguard unit.

  An IP packet can TERMINATE inside the Vanguard unit.

WAN to Vanguard:	The IP packet is received from the WAN(cellular) interface and is destined to the Vanguard unit.
LAN to Vanguard:	The IP packet is received from the LAN interface and is destined to the Vanguard unit.
WLAN to Vanguard:	The IP packet is received from the WiFi interface and is destined to the Vanguard unit.

  An IP packet can ORIGINATE from the Vanguard unit.

Vanguard to WAN:	The IP packet is sent by the Vanguard unit to the WAN(cellular) interface.
Vanguard to LAN:	The IP packet is sent by the Vanguard unit to the LAN interface.
Vanguard to WLAN:	The IP packet is sent by the Vanguard unit to the WiFi interface.

  An IP packet can be FORWARDED by the Vanguard unit.

WAN to LAN:	The IP packet is received on the WAN(cellular) interface and forwarded to the LAN interface.
WAN to WLAN:	The IP packet is received on the WAN(cellular) interface and forwarded to the WiFi interface.
LAN to WAN:	The IP packet is received on the LAN interface and forwarded to the WAN(cellular) interface.
LAN to WLAN:	The IP packet is received on the LAN interface and forwarded to the WiFi interface.
WLAN to LAN:	The IP packet is received on the WiFi interface and forwarded to the LAN interface.

WLAN to WAN: The IP packet is received on the WiFi interface and forwarded to the WAN(cellular) interface.

If the Exclude field is checked, it means that in order for the packet to match with this criteria, it must NOT be processed in the given direction.

- **Action:**
  Keep : If IP filtering is enabled and an IP packet matches all criteria in the IP filter, keep the IP packet (continue normal processing of the IP packet).
  Drop : If IP filtering is enabled and an IP packet matches all criteria in the IP filter, drop the IP packet.

Custom IP Filters

Del:
Click on Del to delete the filter.

3.5 WLAN SETTINGS

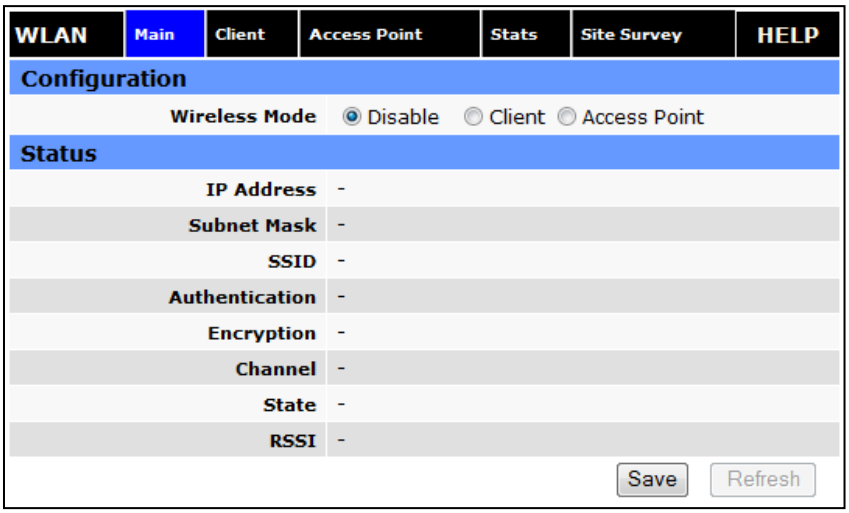
The WLAN interface of the Vanguard Cellular Broadband Router can be configured to operate in Client mode or in Access Point mode.

The AUX LED displays the status of the WLAN interface:

Off	The WLAN interface is not installed.
Red	The WLAN interface is not disabled.
Amber	The WLAN interface is configured for Client mode and is searching for an Access Point.
Green	The WLAN interface is not configured for Client mode and is connected to an Access Point, or is configured for Access Point mode and is ready to accept connections.
Flashing Green	There is data traffic on the WLAN channel.

3.5.1 MAIN

Figure 35: WLAN – Main



Configuration

Wireless Mode:

Disable	The WLAN interface is disabled.
Client	The WLAN interface operates in Client mode. Parameters can be set on the *Client* tab.
Access Point	The WLAN interface operates in Access Point mode. Parameters can be set on the *Access Point* tab.

Status

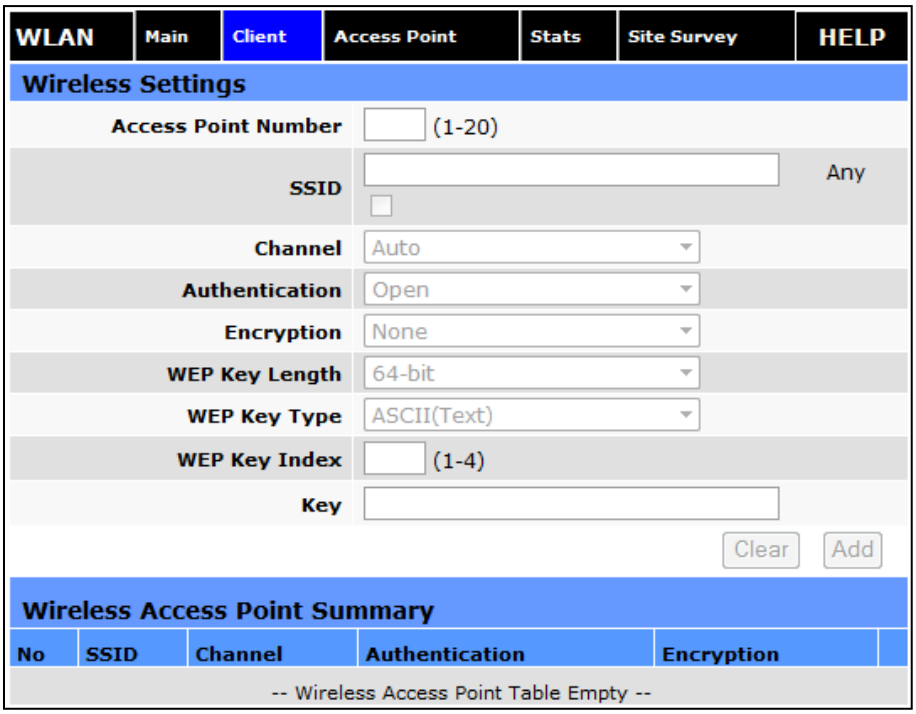
- **IP Address:**
  IP Address assigned to the WLAN interface.
- **Subnet Mask:**
  Subnet mask assigned to the WLAN interface.
- **SSID:**
  Name of the wireless local area network.
- **Authentication:**
  Authentication method currently used.
- **Encryption:**
  Encryption method currently used.
- **Channel:**
  Channel currently in use.
- **State:**
  Current state of the WLAN interface. In Access Point mode, indicates how many clients are connected.
- **RSSI:**
  Received Signal Strength indicator.

3.5.2 CLIENT

The user can configure up to 20 Access Points. The Vanguard Cellular Broadband Router will try to connect to the best Access Point in the list that is reachable. When the Vanguard unit connects to an Access Point, it starts a DHCP client on the interface. The Access Point must provide a DHCP server. The DHCP server must provide an IP address, netmask and gateway to the Vanguard unit. When the Vanguard unit is connected to an Access Point, the default route is set to point to the gateway address obtained from the DHCP server.

Note: The Access Point must broadcast the SSID in order for the Client to be able to connect to it.

Figure 36: WLAN – Client



The following table shows the list of available authentications method with their associated encryption methods.

Authentication	Encryption
1) Open	none, WEP
2) Shared	WEP
3) WPAnone	TKIP, AES
4) WPA-PSK	TKIP, AES
5) WPA2-PSK	AES

The following table shows how to set a WEP key.

WEP key	64-bit	128-bit
ASCII (Text)	5 character string (alphanumeric) Example: Hello	13 character string (alphanumeric) Example: LongHello1234
Hex	10 Hexadecimal digits Example: 1A2B3C4D5E	26 Hexadecimal digits Example: 1A2B3C4D5E6F7788990A0B0C0D

The following table shows how to set a TKIP key.

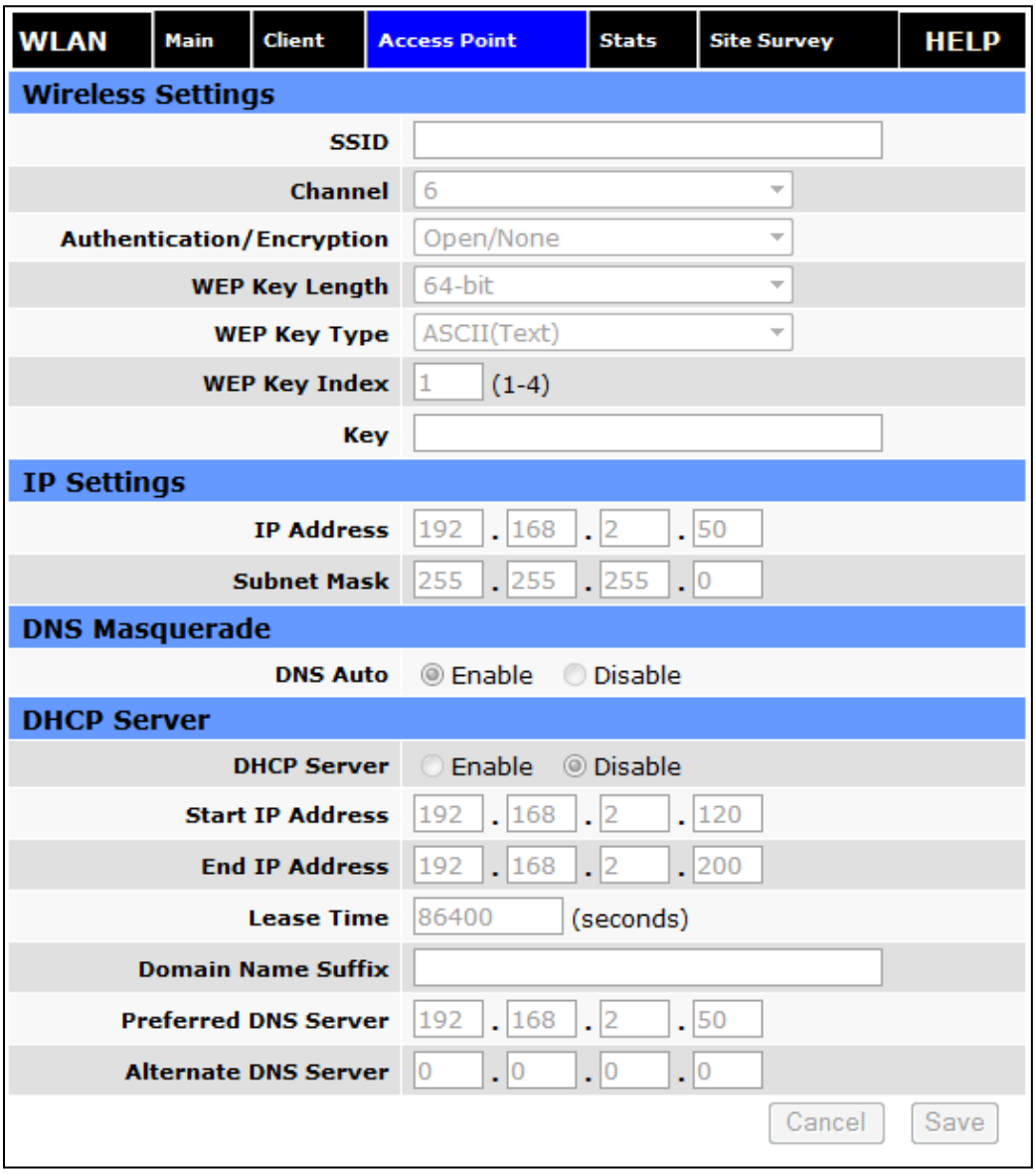
TKIP key	Description	Example
ASCII (Text)	A string of 8 to 63 character (alphanumeric)	Hello123

The following table shows how to set an AES key.

AES key	Description	Example
ASCII (Text)	A string of 8 to 63 character (alphanumeric)	Hello123

3.5.3 ACCESS POINT

Figure 37: WLAN – Access Point



Wireless Settings

Wireless Parameters for Access Point mode.

The following table shows the list of available authentication methods with their associated encryption methods.

Authentication	Encryption
1) Open	none, WEP
2) Shared	WEP
3) WPAnone	TKIP, AES

The following table shows how to set a WEP key.

WEP key	64-bit	128-bit
ASCII (Text)	5 character string (alphanumeric) Example: Hello	13 character string (alphanumeric) Example: LongHello1234
Hex	10 Hexadecimal digits Example: 1A2B3C4D5E	26 Hexadecimal digits Example: 1A2B3C4D5E6F7788990A0B0C0D

The following table shows how to set a TKIP key.

TKIP key	Description	Example
ASCII (Text)	A string of 8 to 63 character (alphanumeric)	Hello123

The following table shows how to set an AES key.

AES key	Description	Example
ASCII (Text)	A string of 8 to 63 character (alphanumeric)	Hello123

IP Settings

- **IP Address:**
  This sets the IP address for the WLAN side of the Vanguard unit.

- **Subnet Mask:**
  Sets the subnet mask for the WLAN side of the Vanguard unit.

DNS Masquerade

- **DNS Auto:**
  Selecting Enable will automatically set the preferred DNS Server to the WLAN IP address of the Vanguard unit. Selecting Disable will allow the user to select the preferred and alternate DNS servers.

DHCP Server Configuration

- **DHCP Server:**
  Selecting "Enable" will configure this device to assign IP addresses to client devices taken from a pool specified by the values entered in "Start IP Address" and "End IP Address". Selecting "Disable" will turn off the DHCP server functionality for the Ethernet interface.

  The Vanguard helps to protect against addressing conflict by preventing the operator from saving the configuration when the DHCP lease range conflicts with the interface IP address. If such a conflict exists, a messages is displayed after the user pressed the "Save" button.

- **Start IP Address:**
  DHCP server's IP address pool starting value.

- **End IP Address:**
  DHCP server's IP address pool ending value.

- **Lease Time:**
  Sets the duration, in seconds, that the client is allowed to keep the assigned IP address.

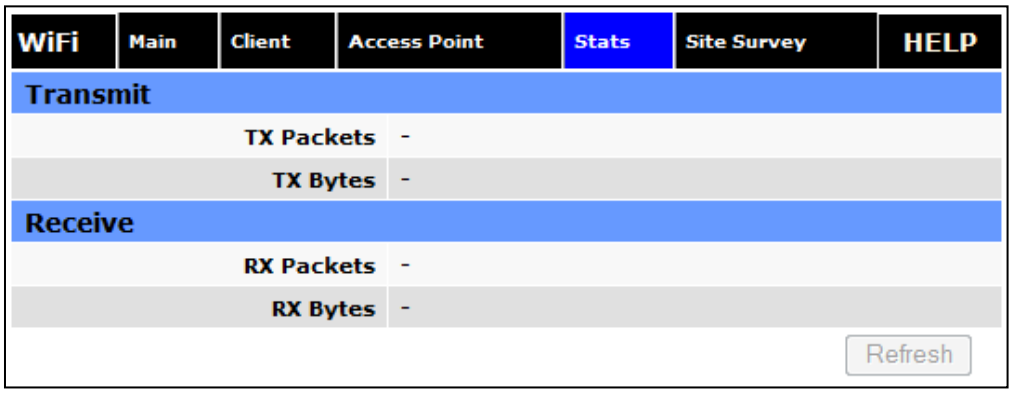
- **Domain Name Suffix:**
  The DNS suffix to be assigned by the DHCP server.

- **Preferred DNS Server:**
  IP address of the preferred DNS server.

- **Alternate DNS Server:**
  IP address of the alternate DNS server.

3.5.4 STATS

Figure 38: WLAN – Stats



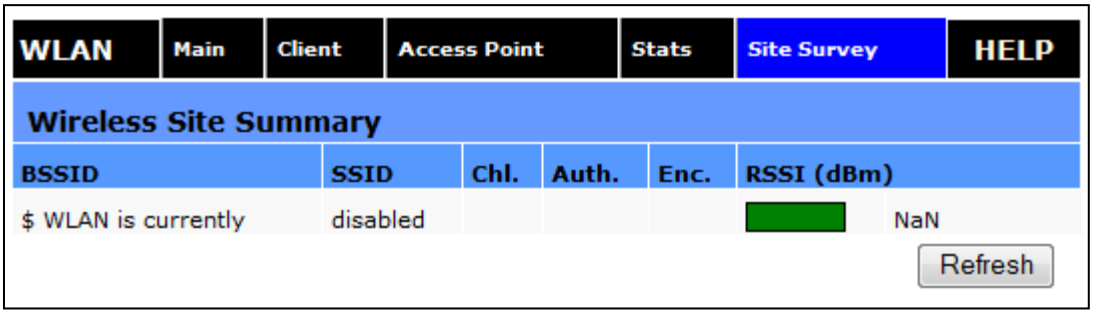
- **TX/RX Packets:**
  Amount of packets sent (received) by the Vanguard unit over (from) the WLAN interface.

- **X/RX Bytes:**
  Amount of bytes sent (received) by the Vanguard unit over (from) the WLAN interface.

3.5.5 SITE SURVEY

When the WLAN interface of the Vanguard unit is configured for Client mode, this page scans for and displays the WLAN Access Points detected. (This operation can take some time to complete.)

Figure 39: WLAN – Site Survey



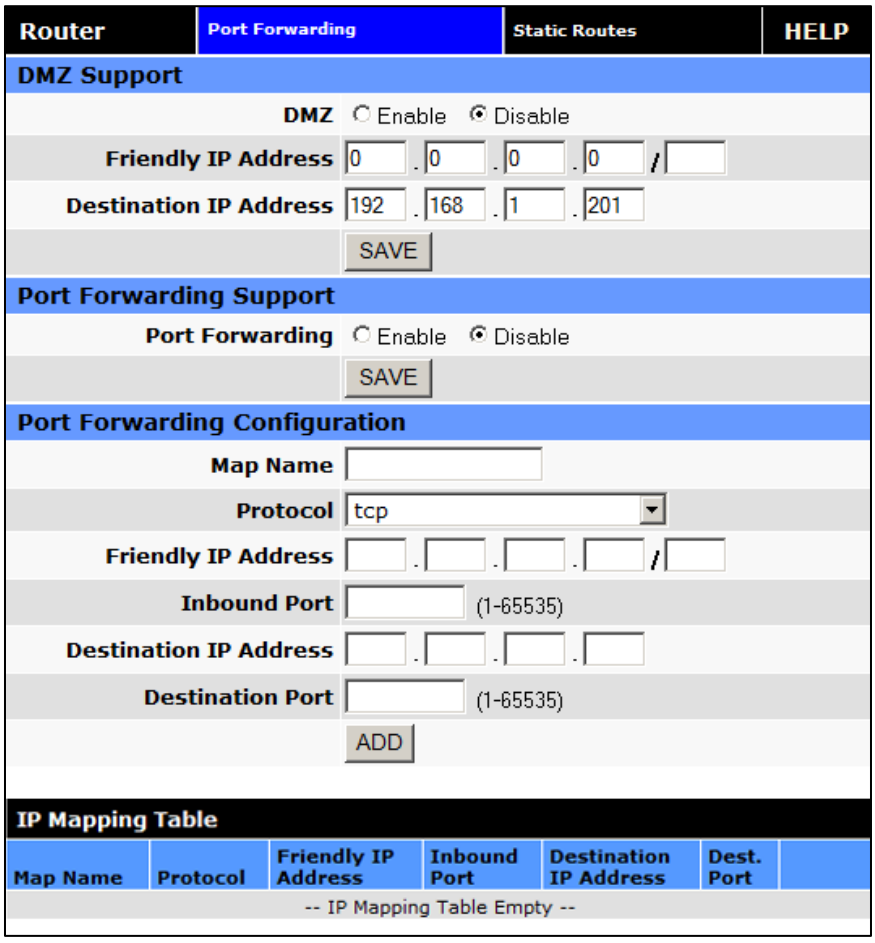
3.6 ROUTER

Select **Router** from the left navigation pane for user access to Port Forwarding and Static Routing tabs.

3.6.1 PORT FORWARDING

Port Forwarding is a technique for transmitting and receiving network traffic through a router that involves re-writing the source and/or destination IP addresses and usually the TCP/UDP port numbers of IP packets as they pass through. The various routing configurations will be displayed in the IP mapping table at the bottom of the screen.

Figure 40: Router – Port Forwarding



DMZ Support

DMZ is a host on the internal network that has all ports exposed, except those ports forwarded otherwise.

- **DMZ**
  Radio button selection to Enable/Disable; Select Enable to allow the modem to use DMZ routes using the address set in the Destination IP Address. Select Disable to shut down the DMZ functionality.

- **Friendly IP Address**
  Optionally restricts DMZ access to only the specified IP address. If set to "0.0.0.0", the DMZ is open to all incoming IP Addresses.

- **Destination IP Address**
  The IP address which has all ports exposed, except ports defined in the Port Forwarding configuration.

The **SAVE** button must be pressed for changes to take effect.

Port Forwarding Support

- **Port Forwarding**
  Radio button selection to Enable/Disable. Select Enable to allow the modem to use the Port Forwarding routes described in the IP mapping table. Select Disable to shut down the Port Forwarding functionality.

The **SAVE** button must be pressed for changes to take effect.

Port Forwarding Configuration

- **Map Name**
  Sets the Map Name for the IP mapping table at the bottom of the screen. The Map Name can be up to ten characters in length. Do not use spaces in the character string

- **Protocol**
  Sets the data protocol as either tcp, udp, or all

- **Friendly IP Address**
  Specifies an IP address that is allowed to access the modem or a wildcard IP address of 0.0.0.0 that allows all IP addresses to access the modem. Leave the fifth box blank (after the /) if specifying a specific IP, or 0.0.0.0. A subnet mask may be entered in the fifth box. The mask indicates how many bits of the IP address to match. This can be a value from 1 to 32.

- **Inbound Port**
  Sets the external port number for incoming requests. (Note: Port Forwarding rules take precedence over the services specified in LAN Settings | Remote Administration | Incoming port, SSH Port, Telnet Port or SNMP Port.)

- **Destination IP Address**
  Sets the Local Area Network Address of the device connected to the modem's Ethernet jack. Inbound requests will be forwarded to this IP address.

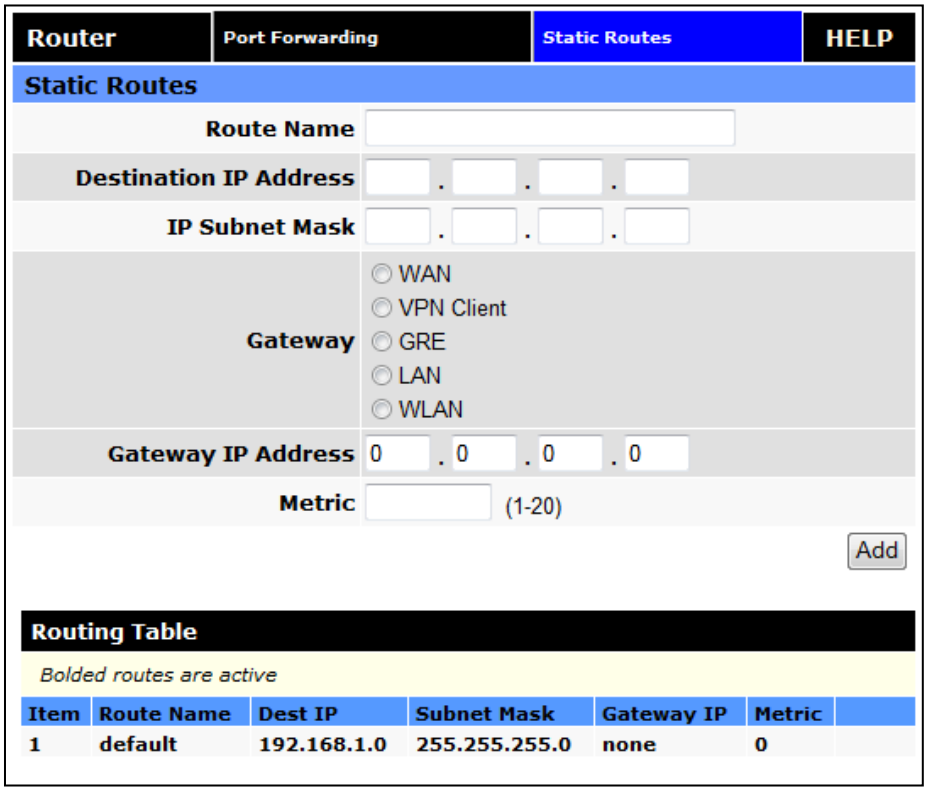
- **Destination Port**
  Sets the Local Area Network port number used when forwarding to the destination IP address.

Once you have completed the entry of the above fields, press the **ADD** button to save the new entry.

3.6.2 STATIC ROUTES

Select the **Static Routes** tab to open the routing configuration page. Static route tables may be created from the Routing screen and appear at the bottom. Static Routing refers to a manual method used to set up routing between networks.

Figure 41: Router – Static Routes



Static Routes

- **Route Name**
  Sets the alphanumeric identifier of the static route in the Static Route Table.

- **Destination IP Address**
  Sets the IP address of the destination network.

- **IP Subnet Mask**
  Sets the subnet mask of the destination network.

- **Gateway**
  Sets ppp (this router's wireless internet connection), pptp (VPN), GRE Tunnel, or the local network IP address for the gateway to the destination network.

- **Gateway IP Address**
  This is only used if local IP addr was selected for gateway. Enter the address of the local gateway.

- **Metric**
  Enter a number from 1 to 20. The lower the metric value the higher the route priority.

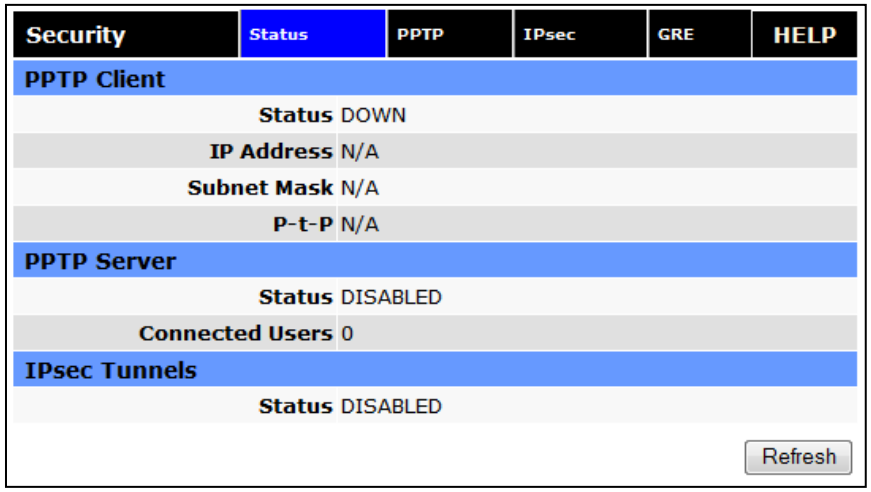
The **ADD** button must be pressed to add the configured route to the Static Route Table.

3.7 SECURITY

From the main navigation panel, select Security for access to PPTP, IPsec and GRE screens.

3.7.1 STATUS

Figure 42: Security – Status



PPTP Client

- **PPTP Client Status:**
  Indicates the status of the PPTP Client interface, usually UP when connected properly. PPTP is the Point-to-Point Tunneling Protocol used to implement a Virtual Private Network (VPN)

- **PPTP IP Address:**
  The current IP address assigned to the modem by the VPN server.

- **PPTP Subnet Mask:**
  Usually set to 255.255.255.255, but may be different depending on VPN.

- **PPTP P-t-P:**
  The PPTP P-t-P is the LAN address of your VPN server.

PPTP Client

- **Status:**
  The PPTP Server is either ENABLED or DISABLED based on user's selection on Security page.

- **Connected Users:**
  Number of users currently connected to the PPTP Server.

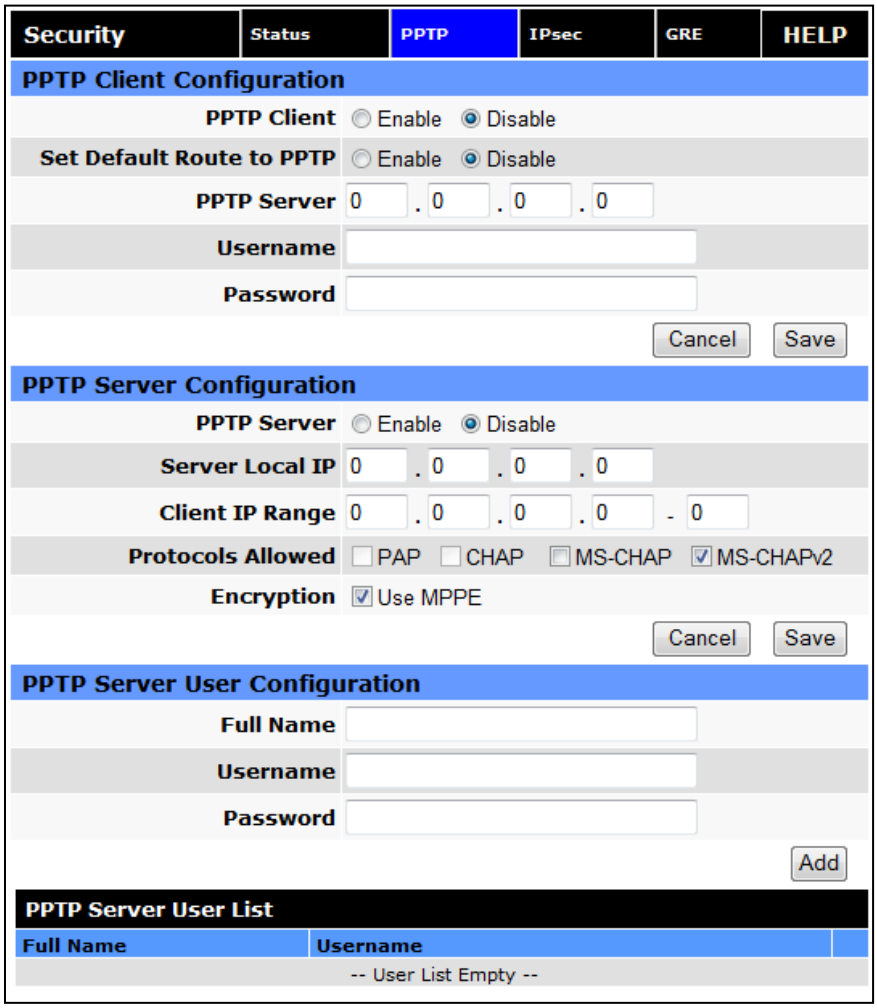
IPsec Tunnels

- **Status:**
  The number of established IPsec tunnels based on the number of tunnels Enabled on the Security | IPsec page.

3.7.2 PPTP

The Point-to-Point Tunneling Protocol (PPTP) is a method for implementing virtual private networks (VPN).

Figure 43: Security – PPTP



PPTP Client Configuration

- **PPTP Client**
  Selecting Enable will allow the PPTP functionality. Selecting Disable will shut off PPTP functionality.

- **Set Default Route to PPTP**
  Selecting Enable will route all IP traffic through the PPTP network. Selecting Disable will route only PPTP traffic through the PPTP network.

- **PPTP Server**
  The IP address of the virtual private network server on which to connect.

- **Username**
  The username required by the VPN server.

- **Password**
  The password, associated with the username, required by the VPN server.

PPTP Server Configuration

- **PPTP Server**
  Selecting Enable starts the VPN server, and selecting Disable stops it.

- **Server Local IP**
  The IP address that clients will use to communicate with the server after they connect.

- **Client IP Range**
  The pool of IP addresses assigned to clients.

- **Protocols Allowed**
  Selecting a protocol will instruct the VPN server to accept clients who use that protocol. The server will reject clients using any of the un-selected protocols.

- **Encryption**
  Selecting 'Use MPPE' will enable Microsoft Point-to-Point Encryption for communication between the server and clients. This option requires the MS-CHAP or MS-CHAPv2 protocol.

PPTP Server User Configuration

- **Full Name**
  This name can be used as a more descriptive name for a client. It is not used by the server. No spaces are allowed in the name.

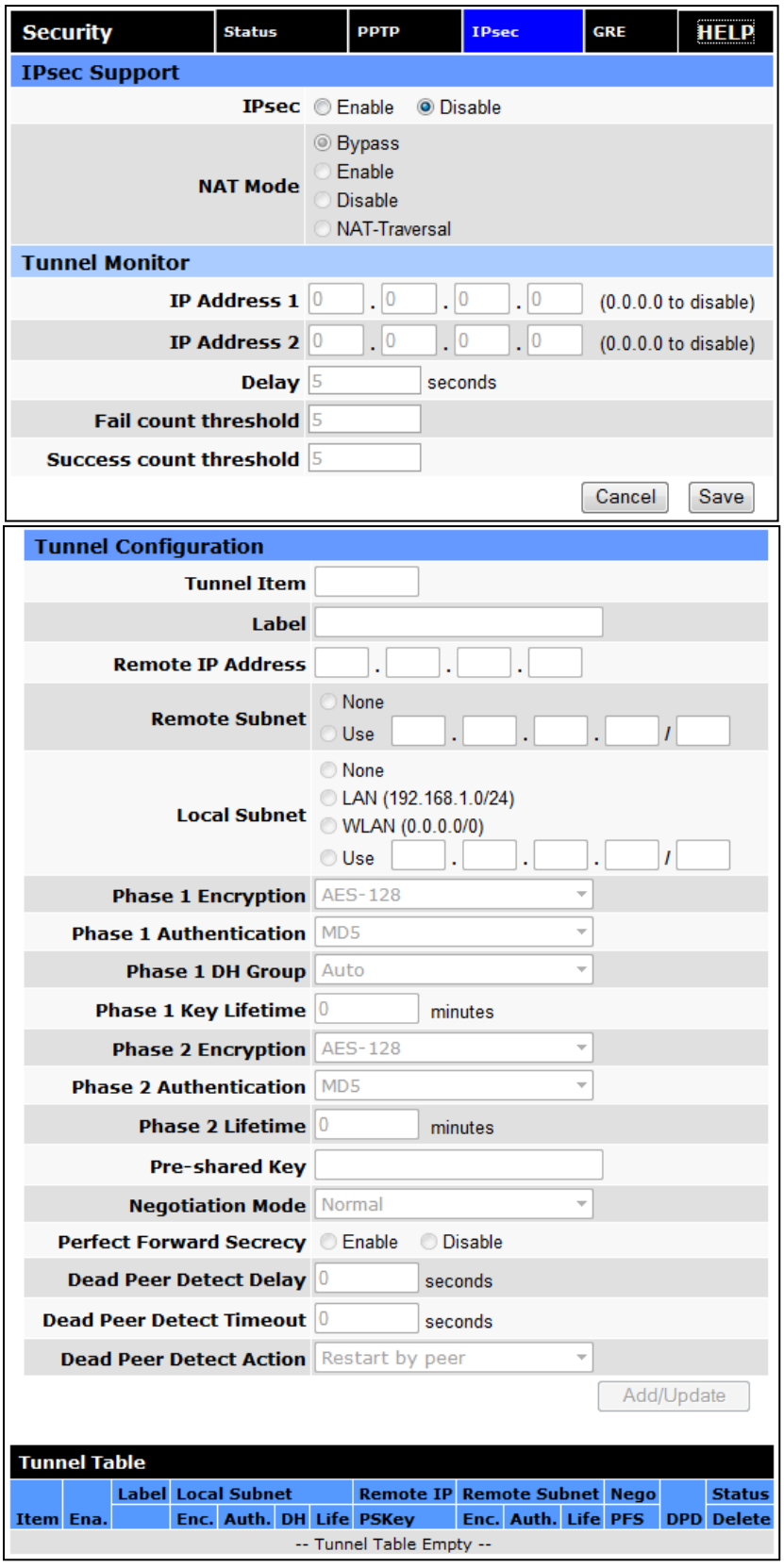
- **Username**
  The name used by a client to log in to the server.

- **Password**
  The password, with associated username, used by a client to log in to the server.

3.7.3 IPSEC

IPsec serves to configure secured communication tunnels. The various tunnel configurations will be displayed in the Tunnel Table at the bottom of the page. All tunnels are created using the ESP (Encapsulating Security Payload) protocol.

Figure 44: Security – IPsec



IPsec Support

- **IPsec**
  Selecting Enable will launch the IPsec process and start all enabled tunnels. Selecting Disable will stop all tunnels and shutdown the IPsec process. Note that all enabled tunnels will be launched automatically when the unit connects to the cellular carrier.

- **NAT Mode**
  Determines how packets are addressed. Selecting Bypass will allow packets coming from Local Subnet addresses through the NAT firewall unchanged. This may be sufficient when traffic only travels from Local Subnet to Remote Subnet. (LAN Settings > Bind to Eth IP may need to be enabled to make sure that packets generated by Vanguard SC services appear to originate from a Local Subnet address.) NAT changes the source address to match the Status > PPP IP Address. NAT-Traversal enables the NAT-T protocol which can support traffic beyond just the Local & Remote Subnets.

Tunnel Monitor

To supplement/complement Dead Peer Detection, tunnels can be monitored by sending periodic pings, with the tunnels being restarted if the pings repeatedly fail. Tunnel monitoring is controlled by the following five parameters …

- **IP Address 1 & IP Address 2:**
  Up to two addresses may be entered. Only those tunnels where the IP address matches the Remote IP Address or belongs to the Local Subnet or Remote Subnet are monitored. A value of 0.0.0.0 disables monitoring.

- **Delay:**
  How often, in seconds, to send pings over the tunnel.

- **Fail count threshold:**
  The number of successive pings that need to fail to cause the tunnel to be restarted.

- **Success count threshold:**
  The number of successive pings that need to succeed for the tunnel to be considered “up” and for the process of counting failed pings to begin.

Tunnel Configuration

- **Tunnel Item**
  Tunnel number, starts from 1 and increments for each new tunnel. To update an existing tunnel, use its corresponding number from the tunnel table. To add a new tunnel, use the last tunnel shown in the Tunnel Table + 1.

- **Label**
  This is a label to identify a tunnel and must correspond to the name specified for the remote endpoint.

- **Remote IP Address**
  The IP address of the remote endpoint of the tunnel.

- **Remote Subnet**

Choose None if encrypted packets are only destined for the Remote IP Address. Use an IP address / mask if encrypted packets are also destined for the specified network that is beyond the Remote IP Address. **IMPORTANT: The Remote Subnet and Local Subnet addresses must not overlap!**

- **Local Subnet**
  Choose None if only packets generated by Vanguard SC services will be sent over the tunnel. Choose Ethernet if packets from the local LAN will also be sent over the tunnel. (LAN Settings > Bind to Eth IP may need to be enabled to make sure that packets generated by Vanguard SC services appear to originate from a Local Subnet address.) Use an IP address / mask if a network beyond the local LAN will be sending packets over the tunnel. **IMPORTANT: The Remote Subnet and Local Subnet addresses must not overlap!**

- **Phase 1 Encryption**
  Use AES-128, AES-256 or 3DES encryption.

- **Phase 1 Authentication**
  Use MD5 or SHA1 hashing.

- **Phase 1 DH Group**
  Negotiate (Auto) or use 768 (Group 1), 1024 (Group 2), 1536 (Group 5) or 2048 (Group 14) bit keys.

- **Phase 1 Key Lifetime**
  How long the keying channel of a connection should last before being renegotiated.

- **Phase 2 Encryption**
  Use AES-128, AES-256 or 3DES encryption.

- **Phase 2 Authentication**
  Use MD5 or SHA1 hashing.

- **Phase 2 Lifetime**
  How long a particular instance of a connection should last, from successful negotiation to expiry.

- **Pre-shared Key:**
  Predetermined key known to both the local unit and the remote side prior to establishing the tunnel.

- **Negotiation Mode**
  Choose Normal to allow IPsec to negotiate some connection parameters. Choose Aggressive to require that only those parameters selected above can be used to create the tunnel.

- **Perfect Forward Secrecy**
  Enable Perfect Forward Secrecy for the session keys.

- **Dead Peer Detection Delay**
  Tunnel keepalive time for R_U_THERE packets during idle periods.

- **Dead Peer Detection Timeout**
  Timeout time during tunnel idle periods where no R_U_THERE_ACK has been received.

- **Dead Peer Detection Action**
  Action to be taken when timeout value is reached.

Once you have completed the entry of the above fields, press the **ADD/UPDATE** button to save the new entry.

Tunnel Table

- **Enable**
  Check Ena to enable a tunnel. The tunnel's state is saved across resets

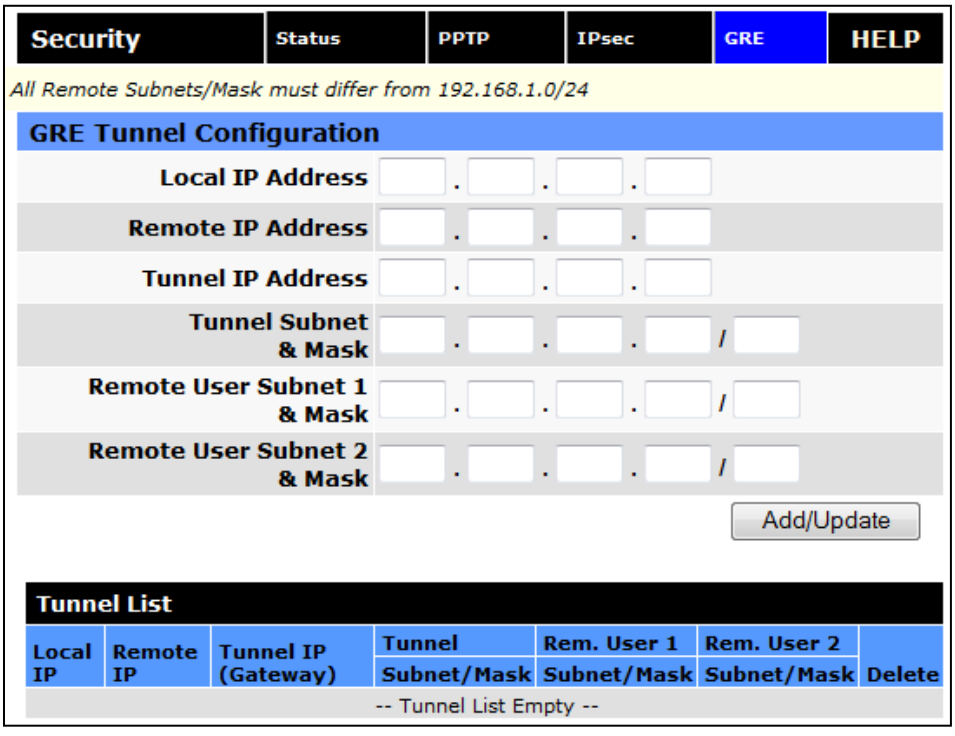
- **View**
  Click on View to open a page showing the log of the tunnel's negotiation activity

- **Delete**
  Click on Del to delete the tunnel

3.7.4 GRE

The GRE page is used to add and delete GRE (Generic Route Encapsulation) tunnels. Current tunnels are listed below. Up to two networks that lie beyond the tunnel may be specified and routes to those networks are automatically created when the tunnel is established. Static local and remote IP addresses are necessary to allow for the tunnel automatic (re)connection.

Figure 45: Security – GRE



GRE Tunnel Configuration

- **Local IP Address:**
  The local (normally WAN interface) IP address associated with the tunnel.

- **Remote IP Address:**
  The remote IP address associated with the tunnel.

- **Tunnel IP Address:**
  The IP address assigned to the tunnel interface.
  [Example: 192.168.10.100]

- **Tunnel Subnet & Mask:**
  The tunnel subnet and mask that must include the above Tunnel IP Address.
  [Example: 192.168.10.0/24]

- **Remote User Subnet 1 & Mask:**
  The IP network representing that of the remote user subnet, accessible via the tunnel.
  [Example: 192.168.20.0/24]

- **Remote User Subnet 2 & Mask:**
  A possible second IP network representing another remote user subnet.
  [Example: 192.168.15.0/24]

NOTE:

- All subnets must differ from one another.
- If more than two remote user subnets are necessary, additional routes can be setup manually via the Router | Static Routes web page using the Tunnel IP Address as the gateway.

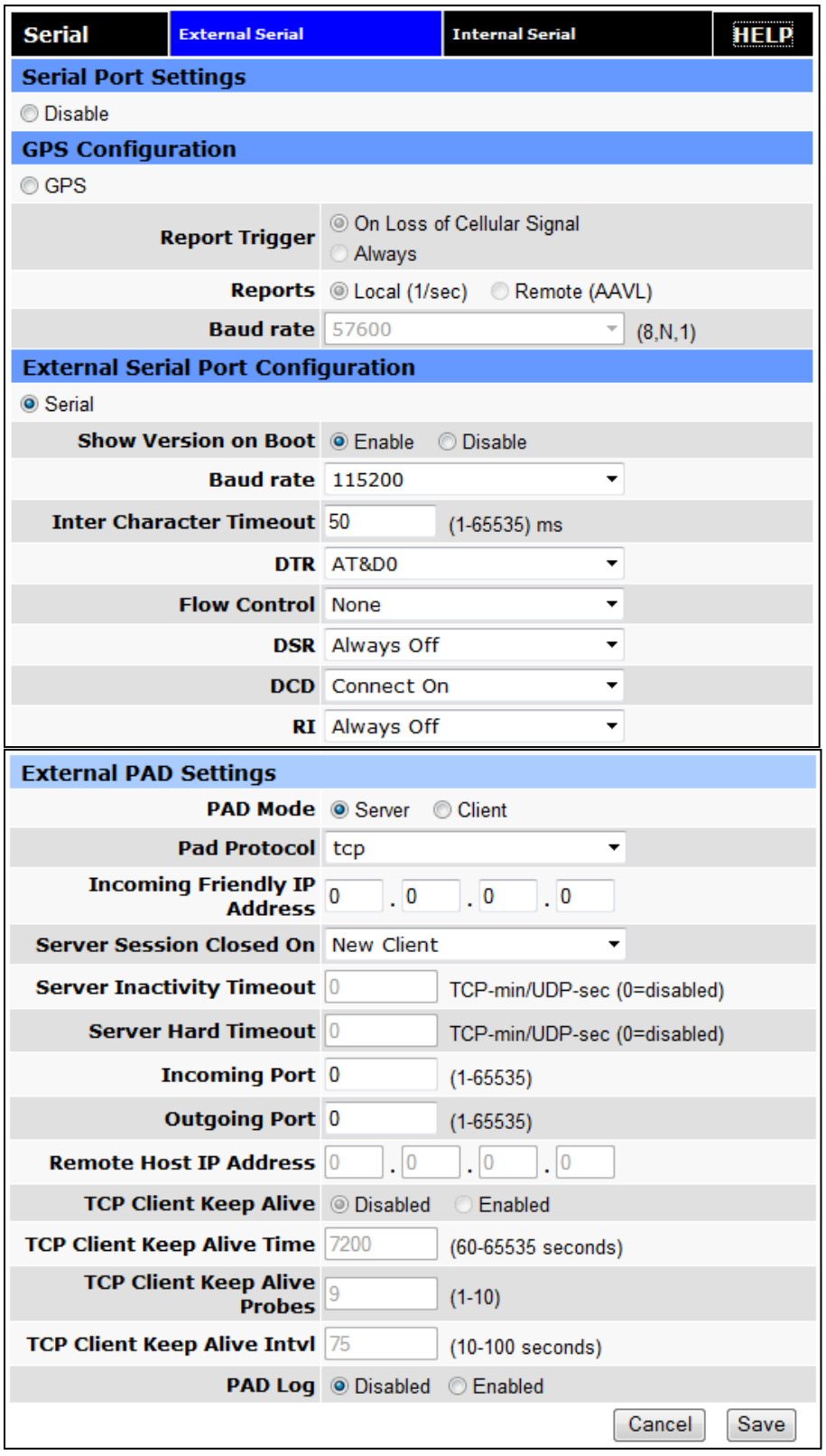
3.8 SERIAL

From the main navigation pane, select Serial for access to both external and internal serial port configuration screens.

3.8.1 EXTERNAL SERIAL

The External Serial screen is used to configure the RS-232 Serial Port parameters and Packet Assembler and Disassembler (PAD) functionality. The PAD feature forwards requests that come in on a specific port to the Serial connector.

Figure 46: Serial – External Serial



Serial Port Settings

- **Serial Port:**
  When disabled, the external serial port is left free for use by an ODP application.

GPS Configuration

Select GPS to enable GPS reports through the serial port. Note that the report format is set on the GPS | Settings page. Set the appropriate TCP Server Format in the Local and/or Remote Delivery sections.

- **Report Trigger:**
  On Loss of Cellular Signal: Select this if the GPS reports are output only when the cellular signal is lost. Note that there can be a delay of around 30 seconds before the serial reports appear on the serial port after the cellular signal is lost.

  Always: GPS reports are always sent out the serial port.

- **Reports:**
  Local (1/sec): Select this to have the Local report sent out the serial port each second.

  Remote (AAVL): Select this to have the Remote report sent out the serial port. The report rate is based on the AAVL settings.

- **Baud Rate:**
  Select the serial port baud rate. The character format is fixed at 8 data bits, No parity, 1 stop bit.

External Serial Port Configuration

- **Show Version on Boot**
  When enabled, the router model number and firmware version are transmitted out the serial port at router boot. Additionally, "OK" is transmitted when router is ready to receive data and when PPP connection is made. When disabled, these indicators will not be transmitted out the serial port.

- **Baud Rate**
  Sets the baud rate of the serial port. Settings may range from 300 to 115,200 bits per second. The default baud rate is 115,200 bps.

- **Inter Character Timeout**
  Sets the Inter Character Timeout from 1 to 65,535 ms.

- **DTR**
  Defines the Data Terminal Ready behavior. Refer to table below for DTR descriptions.

Table 8 – DTR Descriptions

AT&D0	Ignore DTR.
AT&D1	If in the Online Data State, upon an on-to-off transition of DTR, the modem enters Online Command State and issues an OK result code; the call remains connected. Otherwise, ignore DTR.
AT&D2	If in the Online Data State or Online Command State upon an on-to-off transition of DTR, the modem performs an orderly clear-down of the call and returns to the command state. Automatic answer is disabled while DTR remains off.
AT&D4	The modem auto-dials the default remote station upon an off-to-on transition of DTR and enters the Online Data State. The modem ends the call and enters the command state upon an on- to-off transition of DTR.
AT&D5	The modem auto-dials the default remote station upon an on-to-off transition of DTR and enters the Online Data State. The modem ends the call and enters the command state upon an off-to-on transition of DTR.
AT&D6	Upon an on-to-off transition of DTR, the modem performs an orderly clear-down of any session and turns OFF the RF module. Upon an off-to-on transition of DTR, the modem turns ON the RF module and reestablishes the radio session.
AT&D7	Upon an on-to-off transition of DTR, the modem performs an orderly clear-down of any session and turns OFF the RF module. Upon an off-to-on transition of DTR, the modem turns ON the RF module and reestablishes the radio session.
AT&D8	The modem auto-dials the default remote station upon determining DTR is OFF and enters the Online Data State. The modem ends the call and enters the command state upon determining DTR is ON.
AT&D9	The modem auto-dials the default remote station upon determining DTR is ON and enters the Online Data State. The modem ends the call and enters the command state upon determining DTR is OFF.

- **Flow Control**
  Sets the Flow Control to None or Hardware control

- **DSR**
  Sets the Data Set Ready to Always On, On When Available, On When Connected or Always Off. The DSR parameter determines how the modem controls the state of the Data Set Ready circuit. The default value is Always Off.
  - Always On: DSR is always on.
  - On When Available: DSR is on when the RF signal present and phone registered on network.
  - On When Connected: DSR is on when connected to CDMA.
  - Always Off: DSR is always off.

- **DCD**
  The DCD parameter determines how the modem controls the state of the Carrier Detect circuit and the amber DCD LED on the front panel. The default value is Connect On.
  - Always On: DCD is always on.
  - Connect On: DCD is on when connected to a remote host.
  - Always Off: DCD is always off.

- **RI**
  The RI parameter determines how the modem controls the state of the Ring Indicator circuit. The default value is Always Off.

- Always On: RI is always on.
- Connect On: RI tracks incoming ring pulse.
- Always Off: RI is always off.

External PAD Settings

- **PAD Mode**
  Select button to set the PAD mode of the modem as a Server or Client. In Client mode, the modem will initiate an outbound connection to the Remote Host IP Address with the Outgoing Port based on the selected DTR setting. In Server mode, the modem will accept one incoming connection on the specified Incoming Port. The modem will not accept multiple incoming connections at the same time – additional connections are arbitrated based on the Server Session Closed On and Timeout parameters. Note: It is possible to override Server mode and make an outgoing client connection using the RS-232 command set.

  atd*xxx.xxx.xxx.xxx:yyyyy – When in server mode, and no connection is active, the atd* command (followed by an IP address) can be issued to initiate an outbound client connection to the specified IP address and port as specified after the colon. If no port is specified, the port number used is the Outgoing Port parameter. To hang-up such a connection, 3 '+' characters must be inserted into the outgoing stream ("+++"). The modem will return to command mode once it has seen the "+++" and respond with OK. The connection can then be broken by entering "ath". The modem will return to server mode. Such a client connection can be repeated again as necessary, as long as each connection is hung-up before a new one is made.

  Additional note: The modem is capable of only 1 PAD connection at a time. When a manual client connection is in progress (atd*xxx.xxx.xxx.xxx), a connection attempt by an incoming client may result in the disabling of the PAD function until the next device reset.

- **Pad Protocol**

  Sets the data protocol of the PAD to tcp or udp data. If you have set PAD Mode as server you can choose either to support either type of client.

- **Incoming Friendly IP Address**
  Sets the IP address of the device using the PAD functionality

- **Server Session Closed On**
  This is only available if PAD mode is Server. This option selects under which condition the server will terminate an established connection.

  New Client: If a different client attempts to connect, it will be successful and the current client will be forcibly disconnected, without any warning. Otherwise, the current client remains connected indefinitely.

  Timeout: A new client will be accepted only after a specified timeout. The duration of the timeout is specified by the Inactivity timeout, or the Hard timeout, or a combination of both.

  The default value is New Client.

- **Server Inactivity Timeout**
  Time after which the current connection with Client will be terminated without warning. This time starts over again each time the Client sends data to the server. This parameter is ignored if the session closes on New Client. If

PAD protocol is tcp, the timeout is specified in minutes. If UDP, the timeout is specified in seconds. The valid range for either is 1-65535. 0 will disable this timer.

If both Inactivity Timeout and Hard Timeout are enabled, (neither is 0), then a client session will be terminated when either timeout is met. In this case, the value for Hard Timeout must exceed the value for Inactivity Timeout. If the Inactivity Timeout is met, the client will be terminated. If the Hard Timeout is exceeded without meeting the Inactivity Timeout, the client will be terminated by the Hard Timeout.

- **Server Hard Timeout**
  Time after which the current connection with Client will be terminated without warning. This is a fixed time from the initial connection, no matter how much or how often the Client sends data to the server. This parameter is ignored if the session closes on New Client. If PAD protocol is tcp, the timeout is specified in minutes. If udp, the timeout is specified in seconds. The valid range for either is 1-65535. 0 will disable this timer.

  If both Inactivity Timeout and Hard Timeout are enabled, (neither is 0), then a client session will be terminated when either timeout is met. In this case, the value for Hard Timeout must exceed the value for Inactivity Timeout. If the Inactivity Timeout is met, the client will be terminated. If the Hard Timeout is exceeded without meeting the Inactivity Timeout, the client will be terminated by the Hard Timeout.

- **Incoming Port**
  Sets the port number used to forward incoming requests to the serial port

- **Outgoing Port**
  Sets the port number used to send outgoing requests from the serial port

- **Remote Host IP Address**
  Sets the Server IP address to connect with when using the PAD in client mode

- **TCP Client Keep Alive**
  When in client mode and enabled, TCP Keep Alive packets will be sent from the client to the server periodically in order to detect a broken connection. The modem will automatically try to re-establish the connection if necessary. Changing this setting will affect the use of TCP Keep Alive on the next client session. It will not affect an existing session

- **TCP Client Keep Alive Time**
  Time in seconds between keep alive cycles. A keep alive cycle will consist of one or more keep alive probes separated by the keep alive interval.

- **TCP Client Keep Alive Probes**
  Number of keep alive packets that must fail before connection is considered closed

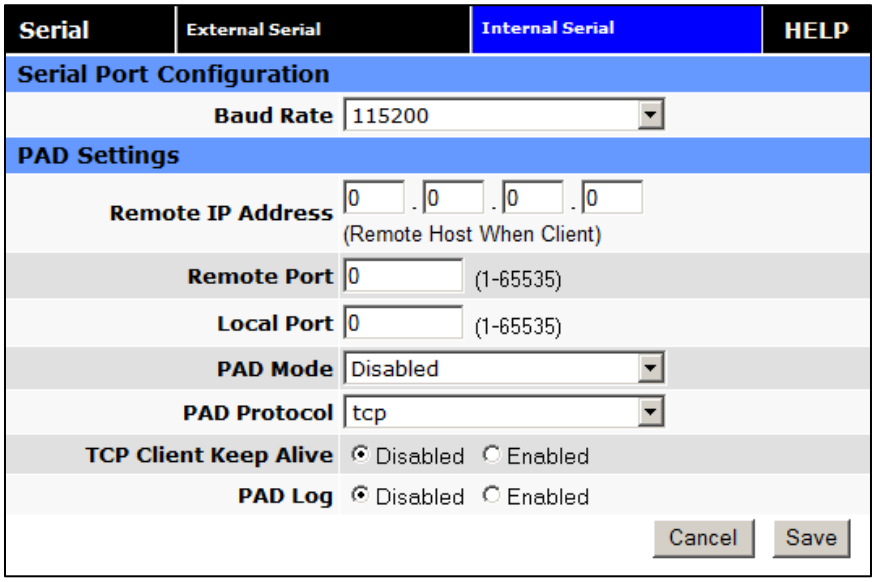
- **TCP Client Keep Alive Intvl**
  Time in seconds after which a keep alive packet is considered to be failed (if not acknowledged). Another packet is sent at this time if TCP Client Keep Alive Probes limit has not been reached

- **PAD Log**
  When enabled, as data passes through the PAD, a copy is stored in a log file located on the modem at /tmp/padlog. The log will stop saving data when full and data is lost at modem reset.

3.8.2 INTERNAL SERIAL

The Internal Serial screen is used to configure the internal RS232 Serial Port parameters and Packet Assembler and Disassembler (PAD) functionality. The PAD feature forwards requests that come in on a specific port to the internal serial port.

Figure 47: Serial – Internal Serial



Serial Port Configuration

- **Baud Rate**
  Sets the baud rate of the serial port. Settings may range from 300 to 115,200 bits per second. The default baud rate is 115,200 bps.

PAD Settings

- **Remote IP Address**
  Sets the IP address of the device using the PAD functionality

- **Remote Port**
  Sets the port number used by the remote device to accept requests from the Vanguard SC

- **Local Port**
  Sets the port number used by the Vanguard SC to accept requests from the remote device

- **PAD Mode**
  Select buttons to set the PAD mode of the Vanguard SC as a Server or Client

- **Pad Protocol**
  Sets the data protocol of the PAD to tcp or udp data

- **TCP Client Keep Alive**
  When in client mode and enabled, TCP Keep Alive packets will be sent from the client to the server periodically in order to detect a broken connection. The modem will automatically try to re-establish the connection if necessary. Changing this setting will affect the use of TCP Keep Alive on the next client session. It will not affect an existing session. When this option is enabled, the timing and number of Keep Alive attempts is controlled by parameters defined on the External Serial page. It is not possible to have different timing settings for each serial port

- **PAD Log**
  If enabled, a log of the data passed through the modem is saved at /tmp/intpadlog. The log will stop saving data when full and data is lost at modem reset.

3.9 GPS

The Vanguard Cellular Broadband Router contains a standalone, high-accuracy, high-report-rate (12 satellites with WAAS and Differential Correction, 1 report per second) GPS receiver.

The GPS LED on the front panel provides the status of the receiver:

GPS LED	MEANING
Off	No GPS installed or Cell-modem GPS disabled
Amber	Acquiring GPS position
Green	Valid positions being reported
Red	Position lost, reporting Last Known Position
Flashing Red	Position lost for more than 2 minutes

3.9.1 AAVL

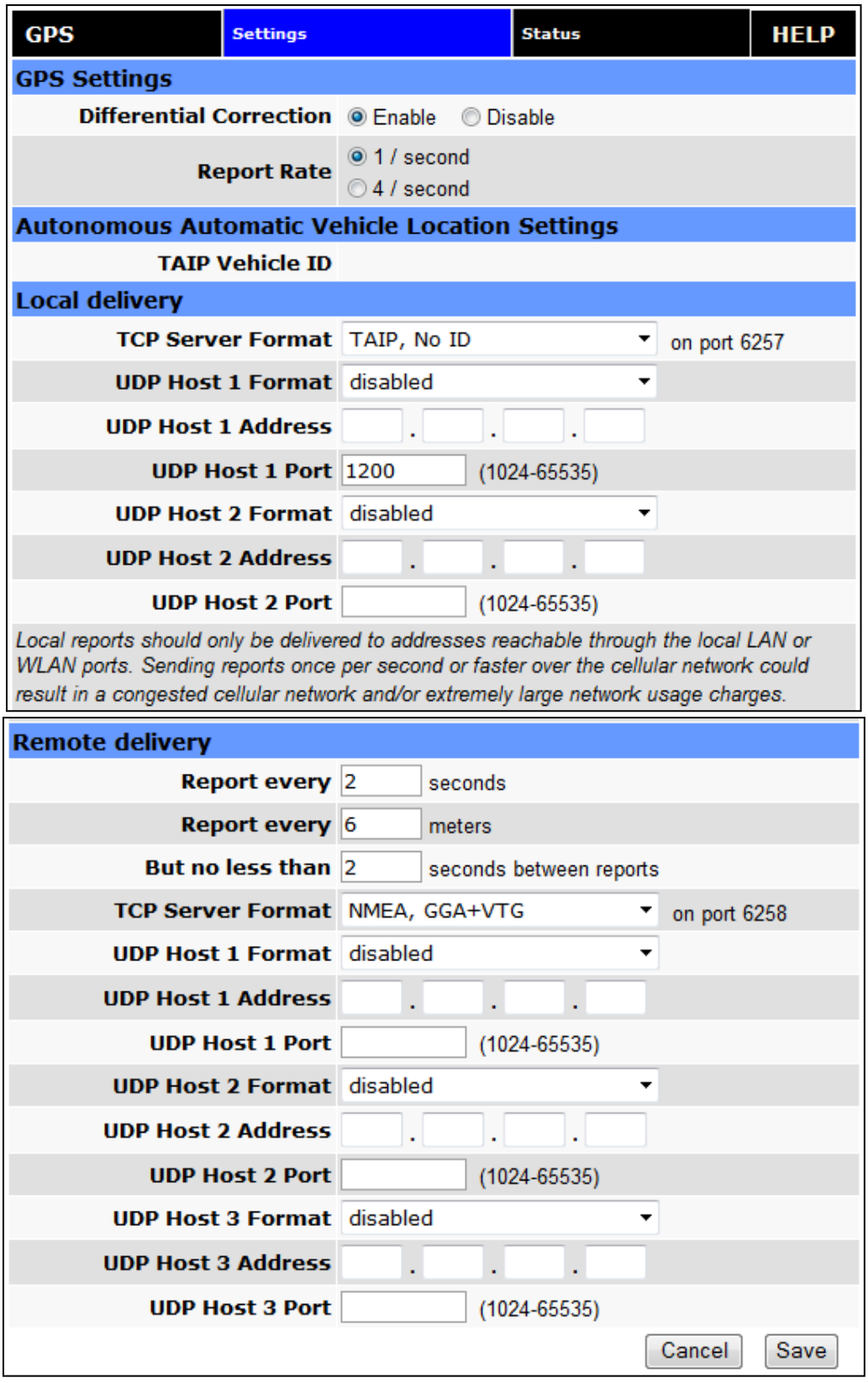
The "Autonomous Automatic Vehicle Location" (AAVL) feature adds the ability for GPS-equipped Vanguard Cellular Broadband Routers to transmit position reports either to a host connected to the local Ethernet port or to a remote host over the cellular network. AAVL allows the system designer to specify the maximum distance or the time interval between remote position reports.

Position reports can be transmitted in a number of possible formats. When the format is disabled or the Address or Port fields are blank, no report is sent.

FORMAT	DEFINITION	EXAMPLE
TAIP, No ID	Trimble ASCII Interface Protocol (TAIP), No ID	>RPV73511+4549542-0736643100035822;*7F<
TAIP, With ID	Trimble ASCII Interface Protocol (TAIP), With ID	>RPV56655+4549542-0736643300000002;ID=ADAM12;*5E<
NMEA, GGA	NMEA GGA (Global Positioning System Fix Data)	$GPGGA,202742.0,4529.7240,N,7339.8585,W,2,9,0.9,28,M,,,,*3E
NMEA, GLL	NMEA GLL (Geographic Latitude & Longitude)	$GPGLL,4529.7241,N,7339.8584,W,202645.0,A,D*7C
NMEA, RMC	NMEA RMC (Recommended Minimum data)	$GPRMC,153716.00,A,4529.72428,N,07339.86082,W,0.007,,180108,,,A*69
NMEA, VTG	NMEA VTG (Vector Track and speed over Ground)	$GPVTG,,T,,M,0.004,N,0.008,K,A*2F

GPS "sentences" are collected the from embedded GPS receiver in the Vanguard Cellular Broadband Router. These sentences are converted into the above formats and are provided to both local and remote delivery services. Two TCP ports are available for clients to connect to and receive reports at the local or remote reporting rate. Each report from the TCP ports is terminated with carriage-return/linefeed characters (CRLF). Up to two local UDP Hosts and three remote UDP Hosts may be specified. Reports are sent as a datagram with no terminating CRLF.

Figure 48: GPS – Settings



3.9.2 SETTINGS

GPS Settings

- **Differential Correction:**
  Differention Correction allows WAAS correction information to be used to improve accuracy of the GPS position reports.

  NOTE: WAAS correction applies to North America only. The WAAS satellites currently in service are 48 (Galaxy 15) and 51 (Anik F1R). The previous WAAS satellites 35 and 47 were taken out of service on 2007/07/30.

- **Report Rate:**
  For applications that require it, GPS reports, normally received from the internal GPS receiver once per second, can be received at a rate of 4 per second. Local Delivery reports are sent at this rate. Remote Delivery reports are still limited by the "But no less than X seconds between reports" setting.

Autonomous Automatic Vehicle Location (AAVL) Settings

- **TAIP Vehicle ID:**
  The TAIP, With ID format allows a report to contain a user-supplied field to identify the sending mobile. This read-only field, which may contain up to 8 letters or digits (special characters not allowed), is taken from the Unit ID that can be set from Unit Status | Basic Settings | Unit ID | ID.

Local Delivery

The Vanguard Cellular Broadband Router will produce a report each second and send it to any connected TCP clients and to the specified UDP hosts. IMPORTANT! Local reports should only be delivered to addresses reachable through the local LAN or WLAN ports. Sending reports once per second or faster over the cellular network could result in a congested cellular network and/or extremely large network usage charges.

- **TCP Server Format:**
  Reports in the specified format (see the table above) are available to local clients that connect to TCP port 6257 of the Vanguard Cellular Broadband Router.

- **UDP Host (1,2) Format:**
  Reports in the specified format (see the table above) are sent to the specified IP address & port. NOTE: Different reports can be directed to the same UDP Host address & port.

- **UDP Host (1,2) Address:**
  IP address of the UDP Host in dotted decimal format.

- **UDP Host (1,2) Port:**
  IP Port of the UDP Host (1024-65535).

Remote Delivery

The Vanguard Cellular Broadband Router can be configured to report after a certain time or distance.

- **Report every () seconds:**
  Trigger the sending of a new remote report if the time since the last remote report exceeds the specified number of seconds.

- **Report every () meters:**
  Trigger the sending of a new remote report if the distance since the last remote report exceeds the specified distance (in meters).

- **But no less than () seconds between reports:**
  To prevent a fast-moving vehicle from reporting too frequently, a lower limit on the time between reports can be specified.

- **TCP Server Format:**
  Reports in the specified format (see the table above) are available to remote clients that connect to TCP port 6258 of the Vanguard Cellular Broadband Router.

- **UDP Host (1,2,3) Format:**
  Reports in the specified format (see the table above) are sent to the specified IP address & port. NOTE: Different reports can be directed to the same UDP Host address & port.

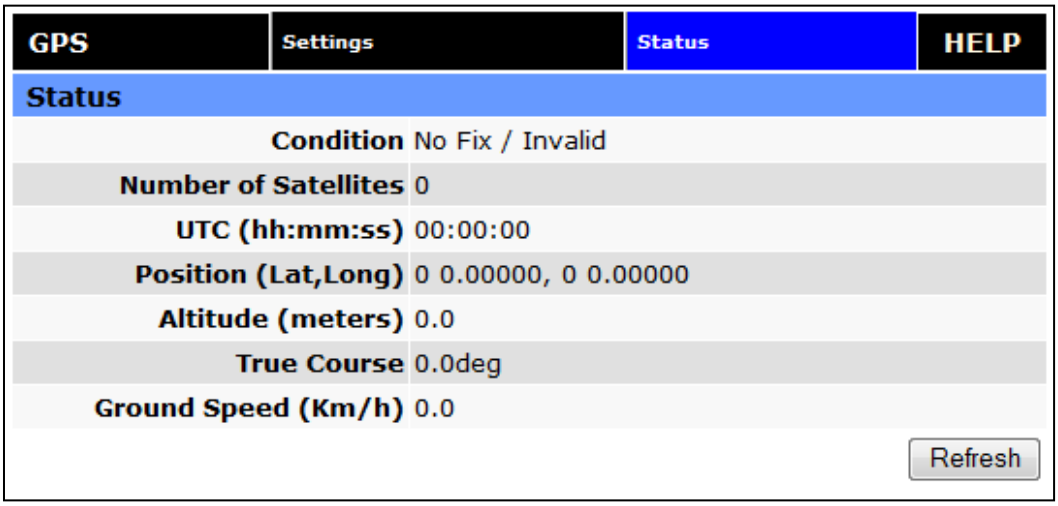
- **UDP Host (1,2,3) Address:**
  IP address of the UDP Host in dotted decimal format.

- **UDP Host (1,2,3) Port:**
  IP Port of the UDP Host (1024-65535).

3.9.3 STATUS

This section displays the current status of the GPS receiver. Click on the "Refresh" button to update the display.

Figure 49: GPS – Status



- **Condition:**
  Indicates the quality of received GPS reports.

Not Installed	This unit does not have a GPS receiver installed.
Disabled	The cell-module GPS receiver has be disabled.
No Fix / Invalid	The GPS receiver has not yet acquired enough satellites to provide an accurate position, or the

	previous Estimated Position is over 3 minutes old.
Standard GPS Fix	GPS position is reported using no additional correction information.
Differential GPS Fix	Differential GPS corrects various inaccuracies in the GPS system to yield measurements accurate to a couple of meters when the mobile is moving and even better when stationary.
Estimated / Last Known Position	Satellite reception has degraded to the point where only an Estimated position or the Last Known Position can be reported.

- **Number of Satellites:**
  Indicates the number of satellite signals being received and used to calculate position.

- **UTC:**
  The current time according to Universal Coordinated Time in hh:mm:ss, using a 24-hour clock format.

- **Position:**
  The current position in Latitude (North-South) and Longitude (East-West). Positions are reported in degrees and decimal minutes. For example, a Longitude of 73 degrees, 39 minutes and 45 seconds West appears as: 73deg 39.75000min W.

- **Altitude:**
  The current height above Mean Sea Level in meters.

- **True Course:**
  Shows the current GPS-generated true course in degrees.

- **Ground Speed:**
  Shows travel speed (in Km/h).

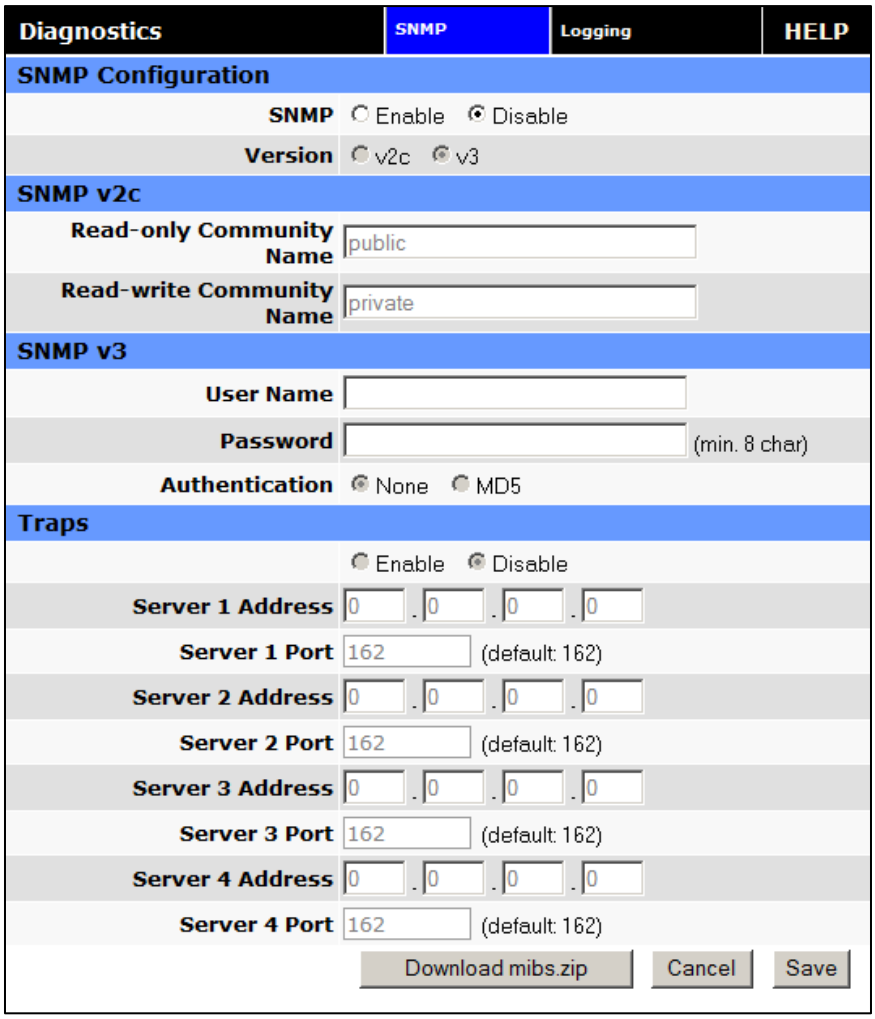
3.10 DIAGNOSTICS

From the main navigation pane, select Diagnostics for access to the SNMP and Logging screens.

3.10.1 SNMP

The Simple Network Management Protocol (SNMP) is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention. SNMP version v2c and v3 are supported with the exception of INFORM.

Figure 50: Diagnostics – SNMP



SNMP Configuration

- **SNMP**
  Selecting Enable will allow the SNMP functionality. Selecting Disable will shut off SNMP functionality.

- **Version**
  With SNMP Enabled, select the corresponding version that matches the SNMP Manager.

SNMP v2c

- **Read-only Community Name**
  The community string used for accessing the read-only Management Information Bases (MIBs)

- **Read-write Community Name**
  The community string used for accessing all Management Information Bases (MIBs) including writable objects

SNMP v3

- **User Name**
  The user name for secure access to the Management Information Bases (MIBs) observing v3 standard

- **Password**
  The corresponding user password for accessing the Management Information Bases (MIBs) including writable objects

- **Authentication**
  Selecting the authentication method for accessing the Management Information Bases (MIBs)

Traps

- **Traps**
  Selecting Enable will allow the active trap events to be reported to the defined server(s). Selecting Disable will desactivate events reporting. Up to four destinations can be specified.

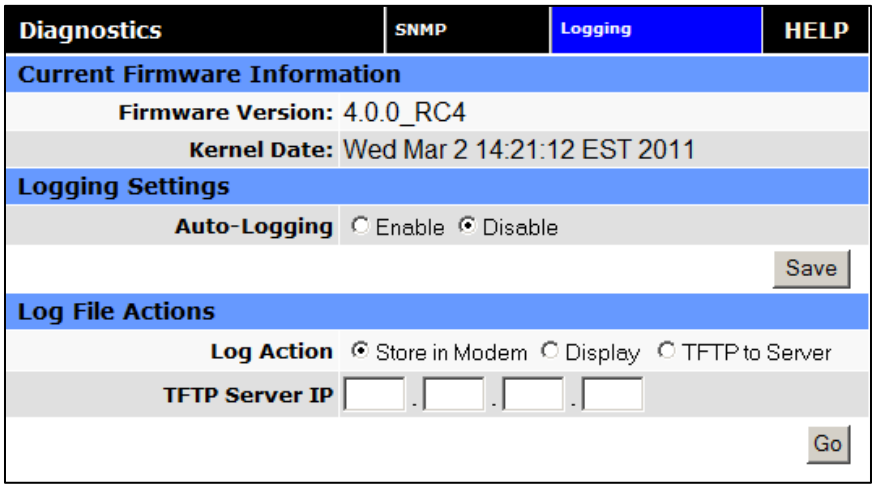
- **Server Address**
  IP address of server to which the trap events will be sent to.

- **Server Port**
  The corresponding server port to which the trap events will be sent to (default 162).

3.10.2 LOGGING

The Logging screen provides a way to capture the current status log of the modem. Log information is useful when contacting CalAmp Technical Support to resolve operational problems.

Figure 51: Diagnosics – Logging



Current Firmware Information

- **Version**
  Displays the modem firmware version currently loaded in the unit

- **Kernel Date**
  Displays the date of the operating system kernel the unit is running

Logging Settings

- **Auto-Logging**
  Selecting Enable and pressing Save will enable the logging capability which saves periodic and event driven logs to permanent memory. Technical Services personnel may find such logs useful in analyzing field issues. Selecting Disable and pressing Save will disable the logging capability. This is the default setting. To make best use of available memory it is recommended to only enable the logging capability if it is necessary to help diagnose an issue.

Log File Actions

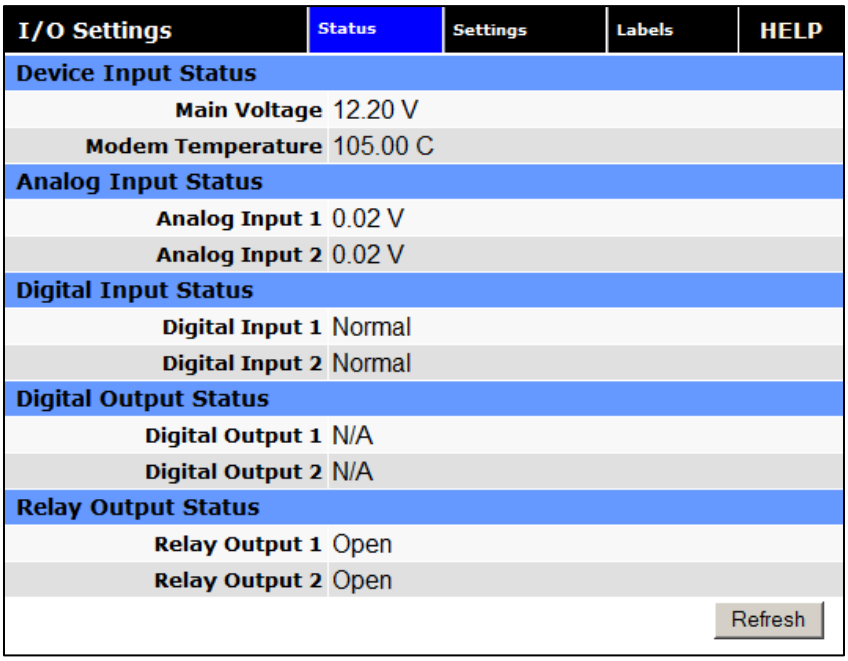
- **Log Action**
  - Store in modem: Selecting Store in Modem and pressing Go will create a current status log, and overwrite any previously saved log. This action will save a log even if auto-logging is disabled. It is best to save the log immediately following the adverse event, and before any reboot. This log will contain only information collected since the most recent reboot of the device.
  - Display: Selecting Display and pressing Go will display a previously stored log directly to the web browser. You can use your mouse to select the text, copy it, and paste it into a text editor to save the log on your computer.
  - TFTP to Server: Selecting TFTP to Server and pressing Go will initiate a transfer of a previously saved log file to a specified IP address using the TFTP protocol. In order for the transfer to be successful, a reachable IP address must be entered under TFTP Server IP and the computer at that IP address must be running a TFTP Server program. Many free TFTP Servers are available for download over the internet. Note that TFTP is different than FTP.

- **TFTP Server IP**
  When selecting TFTP to Server and pressing Go a valid and reachable IP address must be entered here in order to complete the transfer of the saved log file using the TFTP protocol. In order for the transfer to be successful, a reachable IP address must be entered under TFTP Server IP and the computer at that IP address must be running a TFTP Server program. Many free TFTP Servers are available for download over the internet. Note that TFTP is different than FTP.

3.11 I/O SETTINGS

3.11.1 STATUS

Figure 52: I/O Settings – Status



Device Input Status

- **Main Voltage**
  Displays current voltage applied to the unit, in Volts

- **Modem Temperature**
  Displays temperature of the Wireless Modem, in Celsius

Analog Input Status

- **Analog Input 1, Analog Input 2**
  Displays voltage of the specified analog input, in Volts.

Digital Input Status

- **Digital Input 1, Digital Input 2**
  Displays the status of the specified input: Active (high state) or Normal (low state)

Digital Output Status

- **Digital Output 1, Digital Output 2**
  Currently Not Available

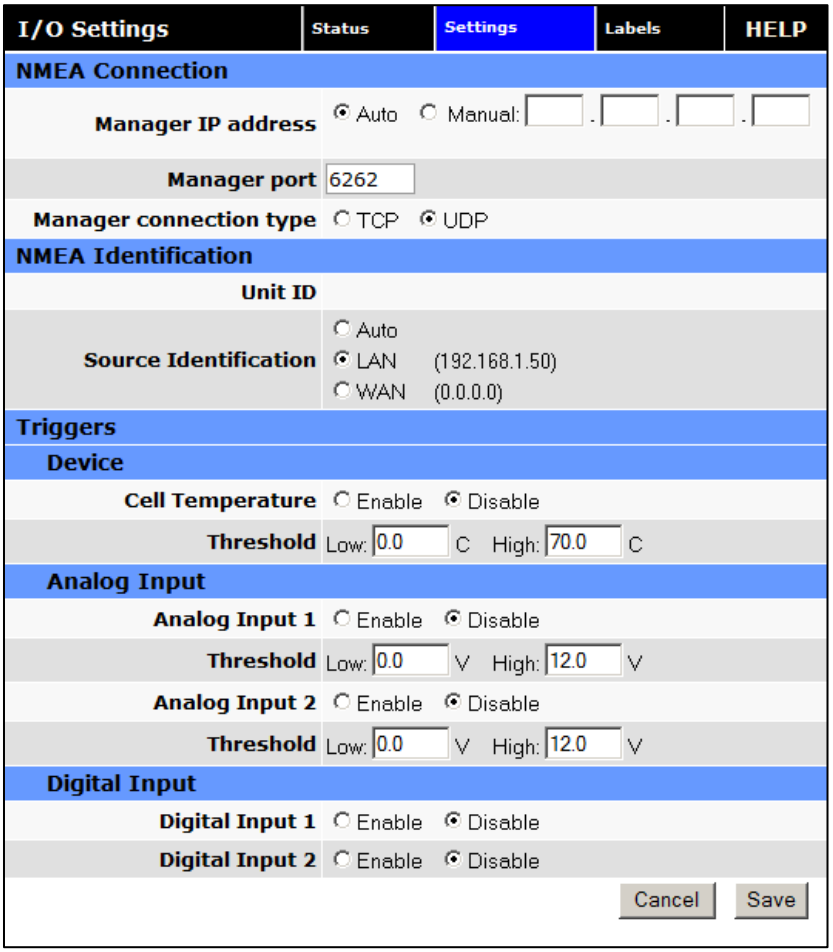
Relay Output Status

- **Relay Output 1, Relay Output 2**
  Displays the status of the specified output as open or closed

3.11.2 SETTINGS

Status Monitoring is provided via NMEA-based protocol. The Vanguard SC I/O subsystem operates according to a manager/agent model. The PC-hosted manager sends requests to the Vanguard SC I/O agent, which performs the required actions. The Vanguard SC agent reports alarms to the PC-hosted manager.

Figure 53: I/O Settings – Settings



NMEA Connection

- **Manager IP address/port**
  The IP address and service port of the NMEA server (manager)

- **Manager connection type**
  The connection protocol to communicate with the NMEA server (manager)

NMEA Identification

- **Unit ID**
  The Unit Name to be included in the NMEA message payload.

- **Source Identification**
  The Unit's IP address that will be included in the NMEA message payload

Triggers – Device

- **Cell Temperature and thresholds**
  Enable or disable NMEA alarm and notification when temperature goes out of range.

Triggers – Analog Input

- **Analog Input and thresholds (1 or 2)**
  Enable or disable NMEA alarm and notification when an analog input goes out of range.

Triggers – Digital Input

- **Digital Input 1, Digital Input 2**
  Enable or disable NMEA alarm and notification when the input state changes.

NMEA Message Format

The messages generated by the Vanguard in response to an alert or acknowledge are as follows. These messages will be sent to the manager at the IP address specified.

Alarm Messge Format

```
$IIALR,hhmmss.ss,xxx,c,s,ip;uid;txt*hh<CR><LF>

hhmmss.ss: NMEA-compliant time (UTC) of initial condition change

xxx: ASCII-encoded hex target descriptor,
     composed of three fields <F1><F2><F3>
     <F1> Type of alarm message
        0    Original message for a given alarm
        1    Repetition of an event already reported
        2-F  Reserved for future use

     <F2> Class of I/O being operated on
        0    Digital input
        1    Analog input
        2    Digital output (contact closure)
        3-F  Reserved for future use

     <F3> I/O Channel number
        Digital Inputs
           0    Ignition sense
           1    DIN1
           2    DIN2
```

```
            3-F  Reserved for Future use

         Analog Input
            0    CiPHR input voltage sense
            1    Modem PCB temperature sense
            2    AIN1
            3    AIN2
            4-F  Reserved for Future use

         Digital Output
            0    DO1 (COM1/NO1)
            1    DO2 (COM1/NO1)
            2-F  Reserved for Future use

c:  NMEA-compliant alarm condition
    A = Threshold exceeded (alarm is active)
    V = Threshold not exceeded (indication of return to normal state)

s:  NMEA-compliant alarm's acknowledge state
    V = unacknowledged

ip:  User-specified IP address (as configured via the Vanguard SC WEB pages)

uid: Free-form text unit identifier (8 characters max)

txt: Free-form alarm/indication text (20 characters max)

hh:  NMEA-compliant checksum
```

Example: Report a temperature-back-in-range indication for the Cell module

```
   $IIALR,135912.01,011,V,V,172.30.41.9;ADAM12;PCI TEMP NORMAL*FF<CR><LF>
```

Example: Report a "repeat: digital input #1" alarm

```
   $IIALR,211545.22,101,A,V,172.30.41.9;ADAM12;MAN DOWN*FF<CR><LF>
```

Ack Message Format

```
$IIACK,xxx*hh<CR><LF>

xxx: ASCII-encoded hex target descriptor,
     composed of three fields <F1><F2><F3>
     <F1> Operation being performed
        0    Acknowledging an alarm or opening a digital output
        1    Closing a digital output
        2    Read Request for an input (analog or digital)
        3-F  Reserved for future use

     <F2> Class of I/O being operated on
        0    Digital input
        1    Analog input
        2    Digital output (contact closure)
        3-F  Reserved for future use

     <F3> I/O Channel number
```

```
        Digital Inputs
           0    Ignition sense
           1    DIN1
           2    DIN2
           3-F  Reserved for Future use

        Analog Input
           0    Vanguard SC input voltage sense
           1    Modem PCB temperature sense
           2    AIN1
           3    AIN2
           4-F  Reserved for Future use

        Digital Output
           0    DO1 (COM1/NO1)
           1    DO2 (COM2/NO2)
           2-F  Reserved for Future use

hh: NMEA-compliant checksum
```

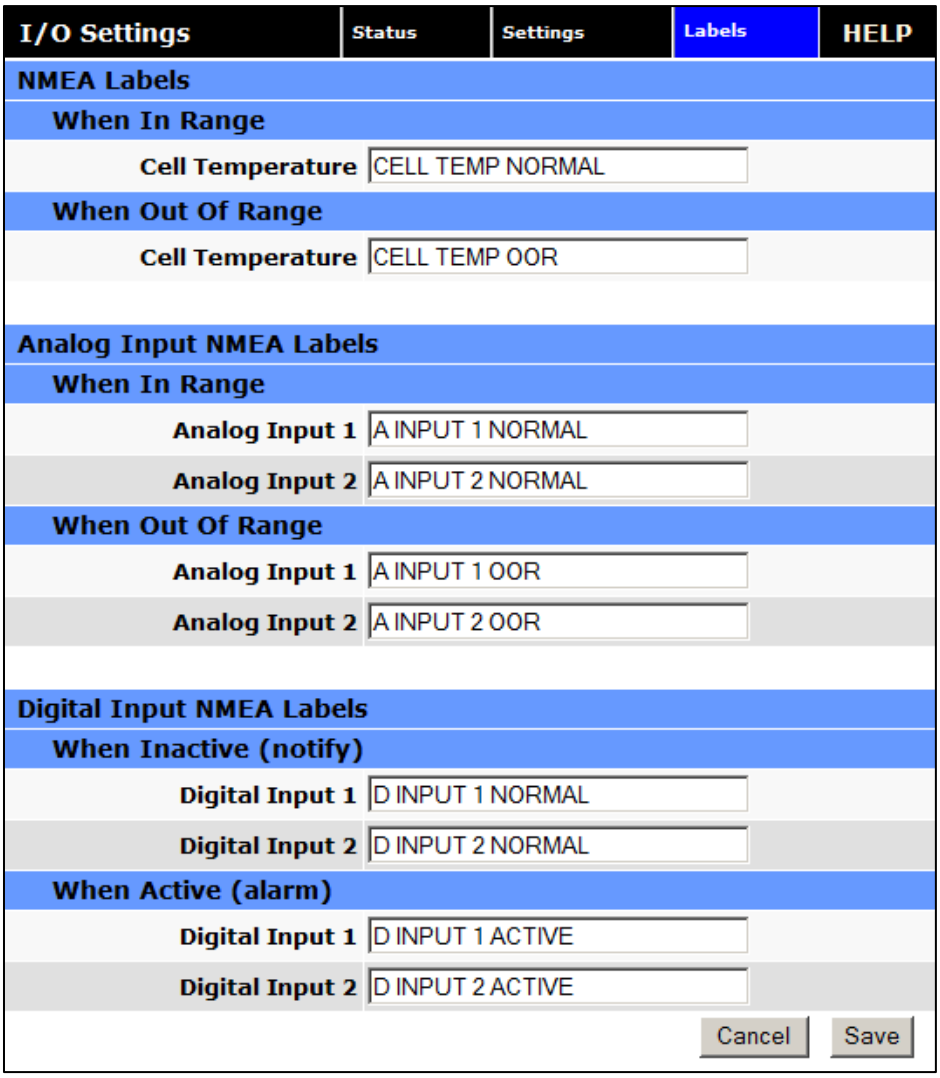
Example: Acknowledge a "Cell module temperature out of range" alarm

```
$IIACK,011*FF<CR><LF>
```

3.11.3 LABELS

Each diagnostic value can be user-defined messages indicating its normal and abnormal conditions.

Figure 54: I/O Settings – Labels



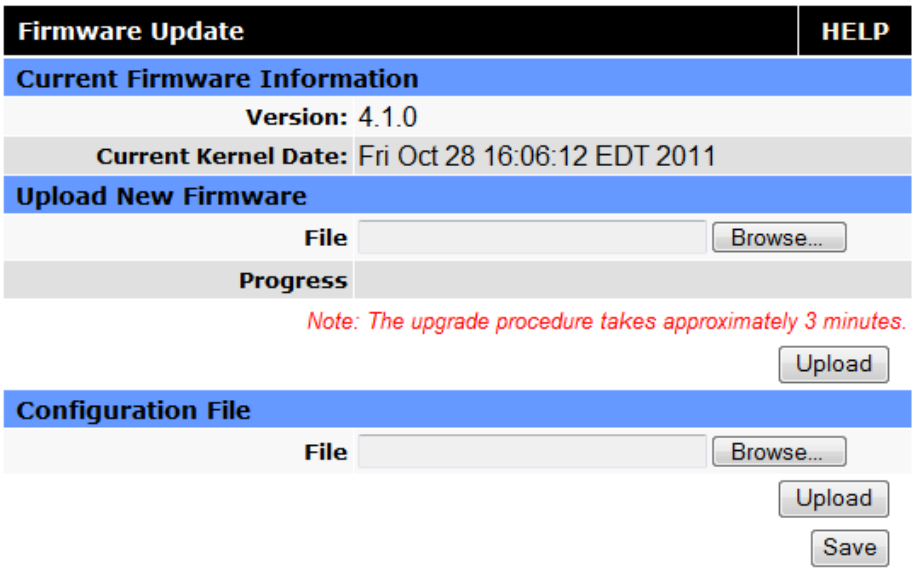
3.12 FIRMWARE UPDATE

When newer versions of the modem firmware become available, the user can download the proper file from the CalAmp web site and manually update the unit by uploading the new firmware.

The update file name is:

- upgradeevdo.tar.gz for the Vanguard SC and 3000 EVDO modem.

Figure 55: Firmware Update



Current Firmware Information

- **Version**
  Displays the modem firmware version currently loaded in the unit.

- **Kernel Date**
  Displays the date of the operating system kernel the unit is running

Upload New Firmware

- **File**
  Enter the update file name or you may use the browse button to locate the file from your hard drive. Updates can be done if Remote Administration is enabled.

- **Progress**
  Displays the update progress after the Save button has been pressed.

- **Upload Button**
  After selecting the firmware upgrade filename above, press the Upload button to begin the firmware upgrade process.

Configuration File

- **File**
  Field to input the uploaded configuration file to the modem. The Browse button can be used to locate the file in a specific folder. The file to be uploaded must be named config.xml. If multiple files need to be maintained, it is recommended that separate directories be used. The update can be done remotely if Remote Administration is enabled.

- **Upload Button**
  After selecting the firmware configuration filename above, press the Upload button to begin the configuration loading process.

- **Save**
  Returns a link to the configuration file on the unit. Right-click the link and select "Save Target As..." to save the file. The link page refreshes after 15 seconds. It is recommended to use the specified filename to save the file. If multiple files need to be maintained, it is recommended to use directory paths to separate the files.

4 IP ADDRESSING

4.1 OVERVIEW

When Vanguard cellular router is connected to a cellular carrier, it will always have two IP addresses. The first is the local area network (LAN) address. The Vanguard can be accessed through either the LAN 1 or LAN 2 Ethernet connectors on the front panel using this IP address. This IP address is user configurable and is saved locally in the Vanguard. The factory default IP address is 192.168.1.50 with a subnet mask of 255.255.255.0.

The second Vanguard IP address is assigned by the cellular carrier each time the Vanguard connects to the cellular network. Often, this IP address is publically accessible from the Internet, however in some instances the cellular carrier may assign an IP address that is protected by firewalls. When a publically accessible IP address is assigned, data flows can be initiated from either the Vanguard or from the Internet. When an IP address is protected by cellular firewalls, data flows can only be initiated from the Vanguard. In either case, after a data flow has been established, data is free to move in both directions.

4.2 IP ADDRESSING TUTORIAL

The default LAN subnet of the Vanguard consists of addresses from 192.168.1.0 to 192.168.1.255. The first and last IP address a subnet is always reserved, no matter what the subnet size is. The first IP address in the subnet is the Network ID. The last IP address in the subnet is the Broadcast Address.

The example below illustrates a sample Vanguard network. The subnet consists of IP addresses ranging from 192.168.1.0 to 192.168.1.255. The subnet mask is 255.255.255.0. This is sometimes written in shorthand notation as: 192.168.1.50/24 since the subnet mask 255.255.255.0 contains 24 ones then 8 zeros when it is converted to binary.

The first address 192.168.1.0 is reserved for the Network ID. The last address 192.168.1.255 is reserved for the broadcast address. There are 254 valid IP addresses that may be assigned to hosts on the LAN network.

Ethernet Subnet Mask	*255.255.255.0*	
Network ID	*192.168.1.0*	*(reserved – first IP address in subnet)*
Broadcast Address:	*192.168.1.255*	*(reserved – last IP address in subnet)*

Vanguard	*192.168.1.50/24*
PLC/RTU #1	*192.168.1.10/24*
Computer #1	*192.168.1.125/24*

By changing the subnet mask, the network can be made to include as many or as few IP addresses as desired. Ethernet devices can only talk directly to other devices that have IP addresses within the same IP subnet. For example, Computer #1 from the example above can only talk with locally connected devices that have IP addresses between 192.168.1.1 and 192.168.1.254. When Computer #1 wants to talk to another server on the Internet, it will send its data packet to the local gateway. In this case the local gateway is the Vanguard router. Since the Vanguard has two IP addresses (each IP address is on a separate subnet), it can forward the packet from the LAN network (192.168.1.0/24) to the cellular network. The packet will continue to be forwarded in a similar fashion, from subnet to subnet, until it reaches its final destination.

4.3 PRIVATE VERSUS PUBLIC IP ADDRESSES

Certain address ranges in the in IPv4 address space have been reserved as private IP address. Private IP addresses can be used by anyone, without the need to register for an IP address assignment from the IANA (Internet Assigned Numbers Authority). However, private IP addresses are not routable on the Internet. Routers on the Internet will typically drop any packets that are destined for a private IP address. These addresses are reserved for local use only.

Common Private IP Address Ranges:

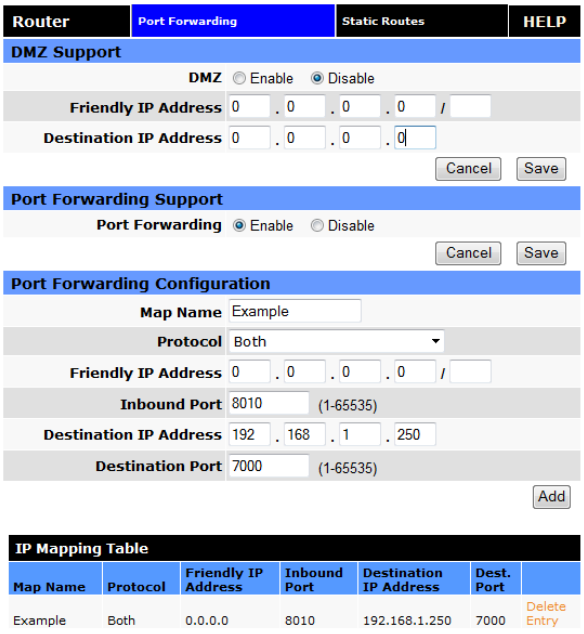
10.0.0.0	*to*	*10.255.255.255*
172.16.0.0	*to*	*172.31.255.255*
192.168.0.0	*to*	*192.168.255.255*

Devices using Private IP addresses must have a router with NAT (network address translation) capability to access the Internet. By default, the Vanguard will perform the NAT function on all outgoing traffic. The Vanguard radio will change the source IP address from the private IP of the local host to the Vanguard's public IP address which was assigned by the cellular carrier. Since the outgoing packet has been modified, a remote server or website on the Internet will think the packet came directly from the Vanguard radio. It will reply back to the cellular IP address of the Vanguard. The Vanguard radio remembers which traffic flows have been established and routes the incoming return traffic back to the desired host device on the local area network.

4.4 PORT FORWARDING

NAT functionality is only useful for traffic flows that are initiated by the Vanguard or by a device that is physically connected to the Vanguard. Port forwarding can be enabled to allow remote devices connecting through the Internet to initiate traffic flows with a local device connected to a Vanguard router.

In the example configuration shown below, a host from the Internet can create either a TCP or UDP connection with the local host at 192.168.1.250 on port 7000 by sending a packet to the cellular IP address of the Vanguard radio at port 8010. When the Vanguard radio receives a packet destined for port 8010 it will look through the Port Forwarding table to see if a matching rule exists. It finds the rule that instructs it to forward this packet to port 7000 of IP address 192.168.1.250. The Vanguard then modifies the destination IP address and port number before forwarding the packet onto the local area network.



Port forwarding is essential for field applications that use polling that is initiated by a polling master. The port forwarding function allows the polling master to establish a data connection through the Internet. The incoming polling message is forwarded by the Vanguard to the appropriate PLC or RTU on the Vanguard's local area network.

4.5 DMZ

Alternately, DMZ can be enabled on the Vanguard radio. When DMZ is enabled, all traffic destined to the Vanguard's cellular IP address that is received from the Internet is forwarded to the DMZ host. The IP address of the DMZ host is specified by the user. Using DMZ can eliminate the need to specify many individual port forwarding rules. However, by exposing all the ports on the local device, the local device may become more susceptible to attacks.

If specific Port Forwarding rules exist in the IP Mapping Table, they will take precedence over the DMZ host.

4.6 FRIENDLY IP ADDRESS

Friendly IP addresses can be used with either port forwarding or DMZ to provide an additional layer of security. When Friendly IP addresses are used, the Vanguard will only forward packets to the LAN if the source IP address of the received packet matches either the specific IP address or range of IP addresses specified in the Friendly IP address field.

> This feature can be disabled by entering 0.0.0.0 in the friendly IP address field. In this case, packets from any host on the Internet can be forwarded to the LAN when either DMZ or Port Forwarding is enabled.

5 IPSEC AND VPN PASS-THROUGH DEPLOYMENT GUIDE

This technical application note will help anyone that wants to build a secure IP network using IPSec and the Calamp Vanguard SC Cellular Modem. The first case will demonstrate the Vanguard SC when used as an IPSec client. The second case will show the Vanguard SC passing an IPSec connection from WAN to LAN. (VPN Pass-through)

6 BENEFITS OF IPSEC

IPSec (Internet Protocol Security Standard) is an industry driven standard that ensures confidentiality, integrity, and authenticity of an IP network. IPSec is a key component of this standard-based, flexible solution for deploying a network-wide policy.

There are two significant benefits to IPSec compliance for our customers: enhanced security features and interoperability.

- **Enhanced security features** give our customers the comfort of knowing that IP based communications are using the most secure and comprehensive standard available today for encryption and authentication.

  The Vanguard SC IPSec encryption support: AES-128, AES-256 and 3DES
  The Vanguard SC IPSec authentication support: MD5 and SHA1
  All tunnels are created using the ESP (Encapsulating Security Payload) protocol.

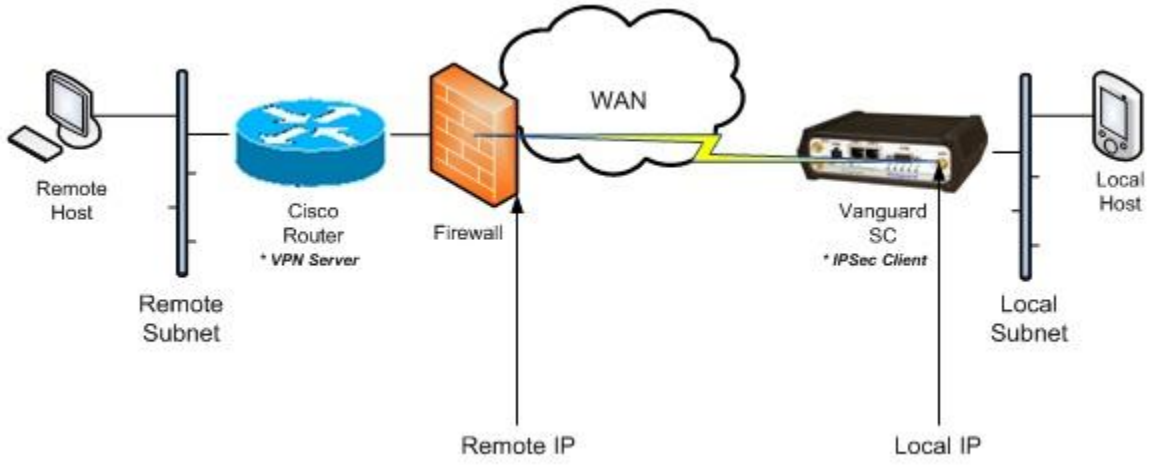
- **Protocol interoperability** means that an IPSec compliant device, such as the Vanguard SC, will be able to exchange keys and encrypted communications with another IPSec compliant product such as a CISCO router. IPSEC compliance ensures that these two different products can negotiate and maintain a secure communication with each other.

7 CONFIGURATION SUMMARY

The first case demonstrates the Vanguard SC as an IPSEC Client to connect to a CISCO router acting as a VPN server. The second case uses the Vanguard SC as an IPSec pass-through between two CISCOsrouters.

Detailed configuration examples are provided for each scenario.

7.1 CASE#1: VANGUARD CONFIGURED IPSEC CLIENT



Where:

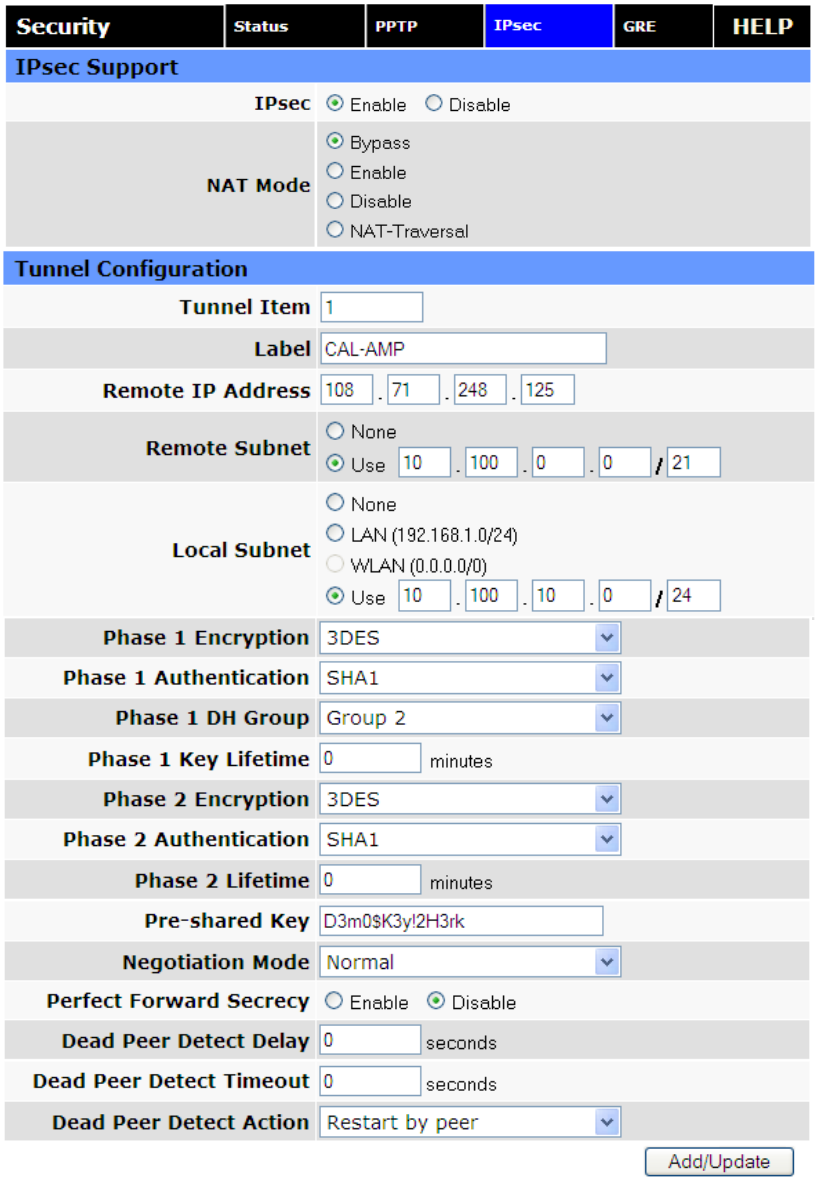
Remote Subnet:	10.100.0.0/21
Firewall External IP (Remote IP):	A.B.C.D
Vanguard PPP IP (Local IP):	W.X.Y.Z
Local Subnet:	10.100.10.0/24

7.1.1 CISCO ROUTER – VPN SERVER CONFIGURATION EXAMPLE

```
!
crypto isakmp policy 2
 encr 3des
 authentication pre-share
 group 2
crypto isakmp key D3m0$K3y!2H3rk address W.X.Y.Z
!
crypto ipsec transform-set esp3dessha1 esp-3des esp-sha-hmac
crypto ipsec df-bit clear
!
crypto map ETH0 10010 ipsec-isakmp
 description CAL-AMP
 set peer W.X.Y.Z
 set transform-set esp3dessha1
 match address V1-CAL-AMP
 qos pre-classify
!
interface FastEthernet4
 ip address A.B.C.D 255.255.255.248
 ip access-group INET-ACL in
 load-interval 30
 duplex auto
```

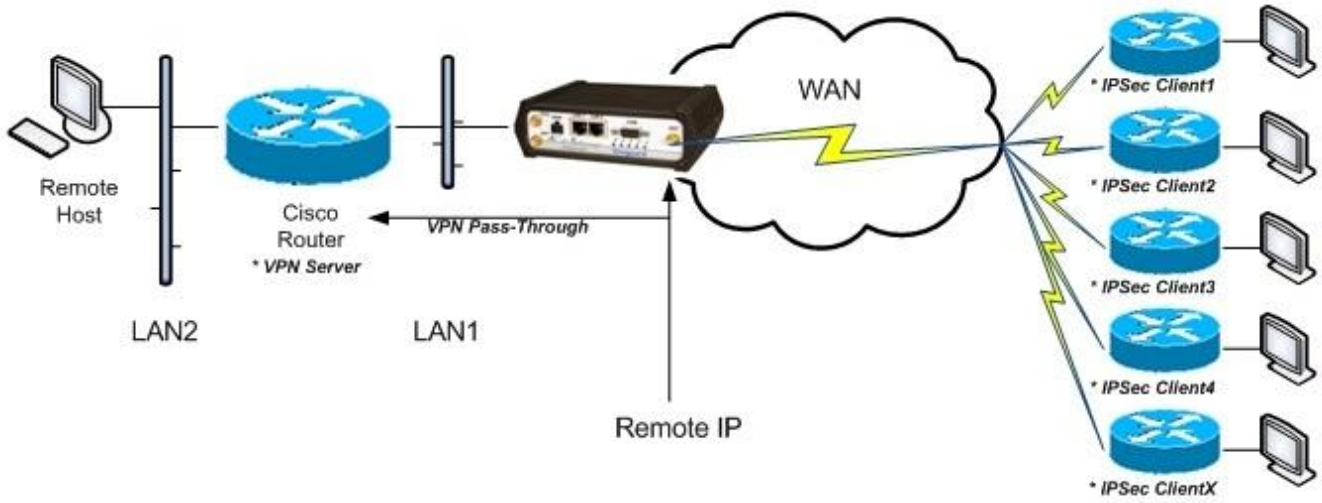
```
 speed auto
 no cdp enable
 crypto map ETH0
 !
!
ip access-list extended INET-ACL
 remark z--------------------------------
 permit esp any any
 permit udp any any eq isakmp
 permit icmp any any echo
 permit icmp any any echo-reply
 deny   ip any any
 remark z--------------------------------
ip access-list extended V1-CAL-AMP
 remark z-----------------------------
 permit ip 10.100.0.0 0.0.7.255 10.100.10.0 0.0.0.255
 remark z-----------------------------
```

7.1.2 VANGUARD SC – IPSEC CLIENT CONFIGURATION EXAMPLE



When the IPSec tunnel will be established between the Vanguard and the CISCO, all the IP Packets coming from 10.100.0.0/21 to 10.100.10.0/24 and vice-versa will pass through the IPSec VPN tunnel.

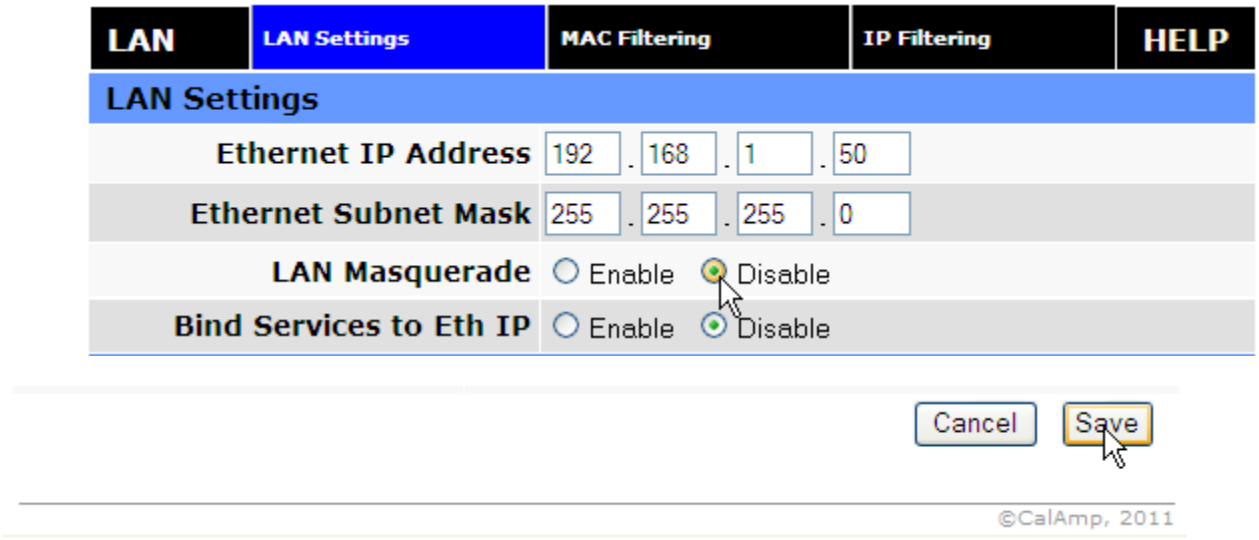
7.2 CASE#2: VANGUARD CONFIGURED VPN PASS-THROUGH



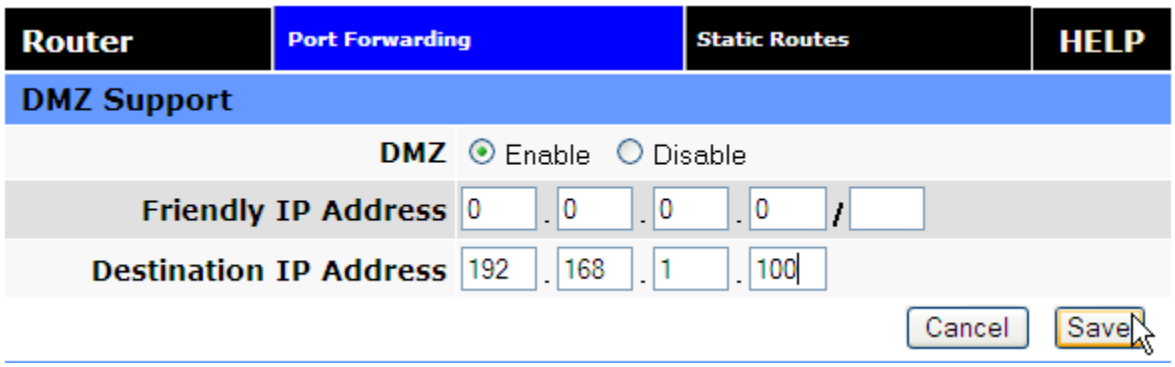
7.2.1 VANGUARD – VPN PASS-THROUGH CONFIGURATION EXAMPLE

Using this scenario, the Vanguard is acting a pass-through to the VPN connection. Apply these parameters changes into the Vanguard.

LAN → LAN Settings → LAN Masquerade = Disabled



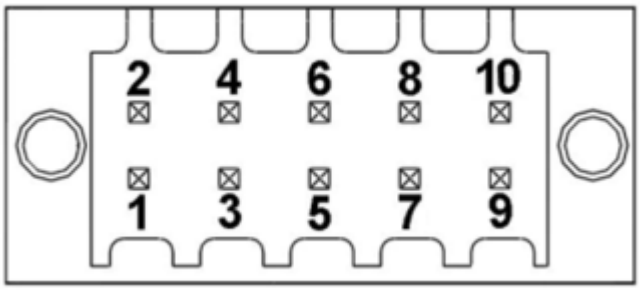
Router → Port Forwarding → DMZ = Enabled → Friendly IP Address = 0.0.0.0 → Destination IP Address = CISCO Router (vpn server) LAN1 IP Address.



Note: We can use port forwarding instead of DMZ to configure the VPN Pass-through.

8 USER I/O PORT

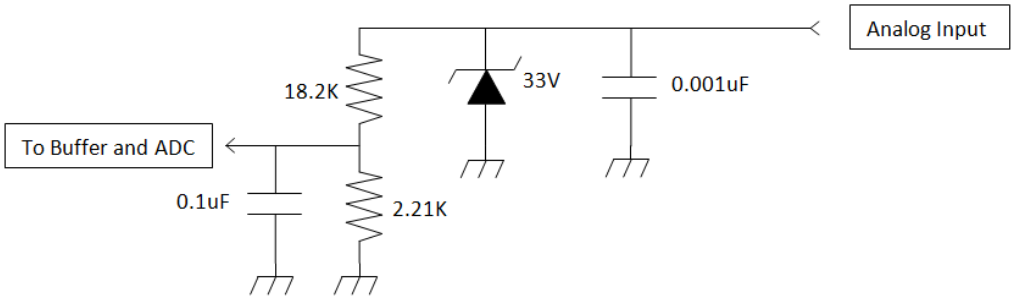
The Vanguard has a 10 pin connector on the back panel that can be used for general purpose analog inputs and digital input/outputs. The connector also provides access to two internal mechanical relays.



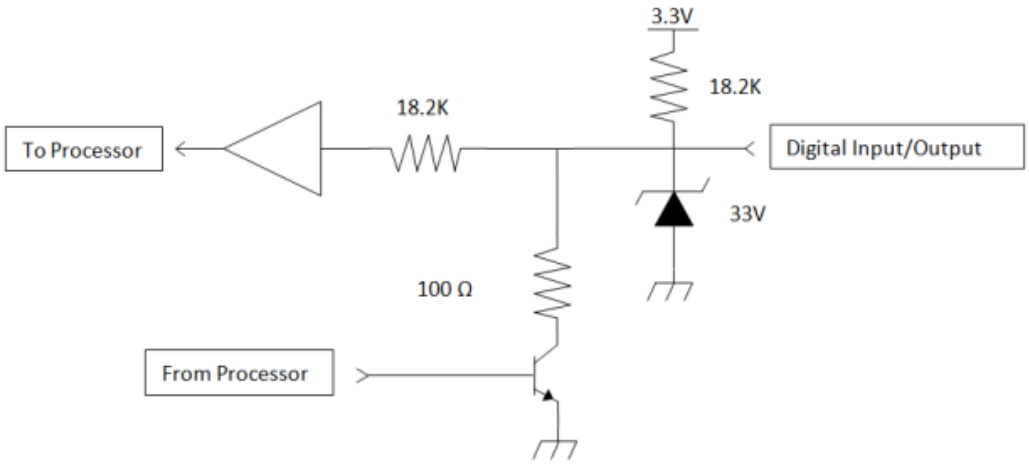
Connector Pin Out		
Pin Number	Name	Notes
1	NO 1	Normally Open Terminal of Relay #1
2	COM 1	Common Terminal of Relay #1
3	NO 2	Normally Open Terminal of Relay #2
4	COM 2	Common Terminal of Relay #2
5	Digital I/O 1	
6	Digital I/O 2	
7	Analog Ground	Analog and Digital Ground have different ground planes internally. They are connected internally at one point only.
8	Digital Ground	
9	Analog Input 1	
10	Analog Input 2	

Symbol	Parameter	Min	Typ	Max	Units
Digital Inputs					
V_{IN}	Digital Voltage Recommended Input Range	0		5.5	V
V_P	Positive Threshold Voltage for Digital Inputs		1.8	2.3	V
V_N	Negative Threshold Voltage for Digital Inputs	0.7	1.1		V
V_H	Hysteresis Voltage for Digital Inputs		0.7		V
Digital Outputs					
V_{OH}	High Level Output Voltage I_{OH} = -10uA I_{OH} = -100uA		 3.1 1.4		 V V
V_{OL}	Low Level Output Voltage I_{OL} = 100uA I_{OL} = 1mA I_{OL} = 10mA		 0.2 0.3 1.2		 V V V
R_{PU}	Pull Up Resistance		18.2		kΩ
R_{PD}	Pull Down Resistance		100		Ω
Analog Inputs					
V_{IN}	Analog Voltage Recommended Input Range	0		30	V
Accuracy			+/- 0.2		V
Relays					
V_{Diff}	NON-HAZARDOUS LOCATION Recommended Differential Voltage Range Between NO and COM Terminals	-30		30	V
I_{Switch}	NON-HAZARDOUS LOCATION Switching Current			1	A
$R_{Initial}$	Initial Contact Resistance			100	mΩ
R_{Open}	Pass Through Resistance when Contacts are Open.		1000		kΩ
Expected Life	1A, 30VDC, 20 Cycles per Minute	10^5			Cycles

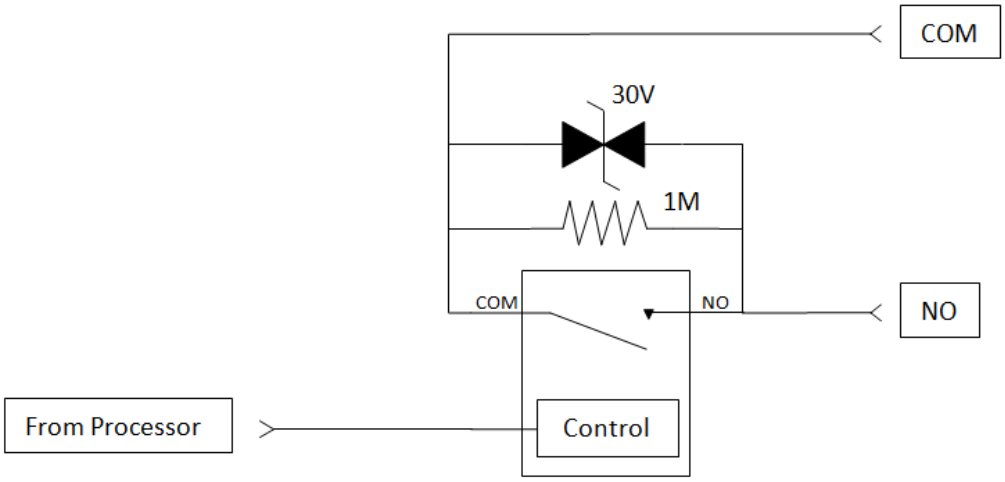
8.1 INPUT CIRCUIT FOR ANALOG INPUTS



8.2 SIMPLIFIED CIRCUIT FOR DIGITAL INPUT/OUTPUTS

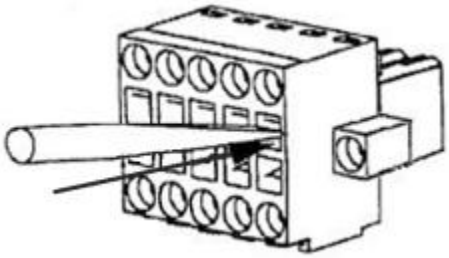


8.3 SIMPLIFIED CIRCUIT FOR MECHANICAL RELAYS

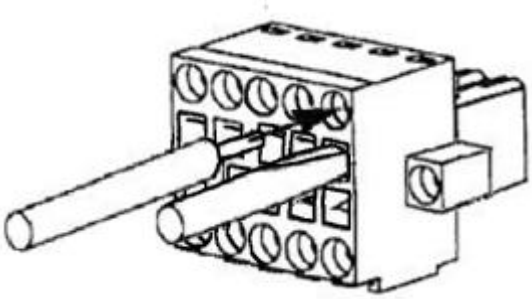


8.4 INSERTING WIRES INTO USER PORT CONNECTOR

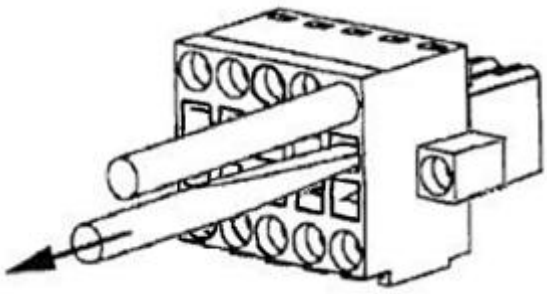
1. Insert 2.5 mm Insertion Tool (CalAmp PN. 250-5006-001) into the wire release slot. Do not twist Insertion Tool.



2. Keeping the Insertion Tool in place, insert wire (28 AWG minimum, 18 AWG maximum) into the wire hole



3. Remove Insertion Tool. Check wire connection.



9 SERVICE AND SUPPORT

Product Warranty, RMA and Contact Information

CalAmp guarantees that every Vanguard SC Modem will be free from physical defects in material and workmanship for one (1) year from the date of purchase when used within the limits set forth in the Specifications section of this manual.

The manufacturer's warranty statement is available in Appendix 1. If the product proves defective during the warranty period, contact CalAmp Customer Service to obtain a Return Material Authorization (RMA).

RMA Request/Contact Customer Service

CalAmp
299 Johnson Avenue, Suite 110
Waseca, MN 56093
Tel: 507-833-8819 ext. 6707
Fax: 507-833-6748

BE SURE TO HAVE THE EQUIPMENT MODEL AND SERIAL NUMBER, AND BILLING AND SHIPPING ADDRESSES ON HAND WHEN CALLING.

When returning a product, mark the RMA clearly on the outside of the package. Include a complete description of the problem and the name and telephone number of a contact person. RETURN REQUESTS WILL NOT BE PROCESSED WITHOUT THIS INFORMATION.

For units in warranty, customers are responsible for shipping charges to CalAmp. For units returned out of warranty, customers are responsible for all shipping charges. Return shipping instructions are the responsibility of the customer.

Product Documentation

CalAmp reserves the right to update its products, software, or documentation without obligation to notify any individual or entity. Product updates may result in differences between the information provided in this manual and the product shipped. For the most current product documentation, visit www.calamp.com for datasheets, programming software and user manuals.

Technical Support

CalAmp
299 Johnson Avenue, Suite 110
Waseca, MN 56093
Tel: 507-833-8819
E-mail: wngsupport@calamp.com

APPENDIX A – ABBREVIATIONS

Abbreviation	Description
APN	Access Point Name
CSD	Circuit Switched Data
CTS	Clear to Send
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DTE	Data Terminal Equipment
IMEI	International Mobile Equipment Identity
EDGE	Enhanced Data rates for Global Evolution
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communication
HSDPA	High-Speed Downlink Packet Access
LED	Light Emitting Diode
ME	Mobile Equipment
MS	Mobile Station
OTA	Over the Air
PDP	Packet Data Protocol
PPP	Point-to-Point Protocol
PPTP	Point-to-Point Tunneling Protocol
PRL	Preferred Roaming List
RSSI	Receive Signal Strength Indication
Rx	Receive
Tx	Transmit

APPENDIX B – WARRANTY STATEMENT

CalAmp warrants to the original purchaser for use ("Buyer") that data telemetry products manufactured by Dataradio ("Products") are free from defects in material and workmanship and will conform to published technical specifications for a period of, except as noted below, one (1) year from the date of shipment to Buyer. CalAmp makes no warranty with respect to any equipment not manufactured by Dataradio, and any such equipment shall carry the original equipment manufacturer's warranty only. CalAmp further makes no warranty as to and specifically disclaims liability for, availability, range, coverage, grade of service or operation of the repeater system provided by the carrier or repeater operator. Any return shipping charges for third party equipment to their respective repair facilities are chargeable and will be passed on to the Buyer.

If any Product fails to meet the warranty set forth above during the applicable warranty period and is returned to a location designated by CalAmp. CalAmp, at its option, shall either repair or replace such defective Product, directly or through an authorized service agent, within thirty (30) days of receipt of same. No Products may be returned without prior authorization from CalAmp. Any repaired or replaced Products shall be warranted for the remainder of the original warranty period. Buyer shall pay all shipping charges, handling charges, fees and duties for returning defective Products to CalAmp or authorized service agent. CalAmp will pay the return shipping charges if the Product is repaired or replaced under warranty, exclusive of fees and duties. Repair or replacement of defective Products as set forth in this paragraph fulfills any and all warranty obligations on the part of CalAmp.

This warranty is void and DRL shall not be obligated to replace or repair any Products if (i) the Product has been used in other than its normal and customary manner; (ii) the Product has been subject to misuse, accident, neglect or damage or has been used other than with CalAmp approved accessories and equipment; (iii) unauthorized alteration or repairs have been made or unapproved parts have been used in or with the Product; or (iv) Buyer failed to notify CalAmp or authorized service agent of the defect during the applicable warranty period. DRL is the final arbiter of such claims.

THE AFORESAID WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. DRL AND BUYER AGREE THAT BUYER'S EXCLUSIVE REMEDY FOR ANY BREACH OF ANY OF SAID WARRANTIES IT AS SET FORTH ABOVE. BUYER AGREES THAT IN NO EVENT SHALL DRL BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES WHETHER ON THE BASIS OF NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. The purpose of the exclusive remedies set forth above shall be to provide Buyer with repair or replacement of non-complying Products in the manner provided above. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as DRL is willing and able to repair or replace non-complying Products in the manner set forth above.

This warranty applies to all Products sold worldwide. Some states do not allow limitations on implied warranties so the above limitations may not be applicable. You may also have other rights, which vary from state to state.

EXCEPTIONS

THIRTY DAY:	Tuning and adjustment of telemetry radios
NO WARRANTY:	Fuses, lamps and other expendable parts